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EXPERIMENT STATION RECORD

Vol. 80 January 1939 No. 1

THE FIFTY-SECOND CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

After an absence of 5 years the Association of Land-Grant Colleges and Universities returned to Chicago for its fifty-second annual convention, which took place from November 14 to 16, 1938. There was the usual large and widely recruited attendance which has come to be expected in this central location even when, as in this case, there were no associated societies or similar groups to augment the delegations to the convention itself. Every State was represented, as well as Puerto Rico, and in many instances the full institutional complement of president, deans of resident instruction, engineering, and home economics, and the directors of extension and research was present.

As for the Federal Government, the presence of the Under Secretary and the Assistant Secretary of Agriculture, the Directors of Extension and Information, and representatives of most of the bureaus and offices of the Department which have important contacts with the land-grant institutions, as well as the Commissioners of Education and Reclamation from the Department of the Interior, attested anew a direct interest. Formal greetings were also brought from the American Farm Bureau Federation by President Edward A. O'Neal and on behalf of Hon. L. J. Taber, master of the National Grange, by Dean John F. Cunningham of Ohio, and the program included addresses by representatives of a number of other bodies, such as the American Council of Education, the American Vocational Association, and the Social Science Research Council. The total registration was well in excess of 350 persons, and the aggregate attendance probably at least 500.

The program of the three general sessions was timely and as usual well diversified in scope. It opened with the address of the president, Extension Director C. W. Creel of Nevada, who reviewed the background and history of the land-grant institutions with special reference to their present and prospective policies. Each year, he asserted, the contribution of these institutions assumes increasing national significance. He cited the opportunities available for additional assistance to the Nation in military preparedness and in promoting democracy, but he indicated that adequate accomplishment in the latter respect was contingent upon increased attention to the political and social sciences. He commended as one of the substantial accomplishments of the year the progress made in improving Federal-State relationships, and as an urgent problem awaiting solution he pointed out the need of strengthening engineering research.

The relation of engineering research to the national welfare was considered in greater detail in an address by President Karl T. Compton of the Massachusetts Institute of Technology. The function of the engineer, according to President Compton, is to bridge the gap between science and the public by developing "the applications in science in such a manner that they may fit beneficially into the existing order of civilization." More first-class engineers with original and inventive talents for the production of new ideas he believed should be the aim in institutional training. "Better technical developments call for scientific and engineering research, training of research workers, adequate funds and facilities, and time."

The extension of library facilities in rural areas was advocated by Dr. L. R. Wilson, dean of the Library Science School of the University of Chicago. Practically one-third of the Nation's population, he declared, are without public library service, and 88 percent of this group are in rural areas. He described various attempts to remedy this situation and suggested a six-point program for the land-grant colleges as follows: Spend more money for their own library upbuilding, place more emphasis on the part libraries play and in training students to use them, try to extend the use of books as well as bulletins in rural areas, devote more study in departments of economics and sociology to library problems, cooperate more extensively with other organizations and agencies for library service, and if possible add library specialists to aid instruction and extension staffs and participate in extramural cooperation.

The address of Hon. John W. Studebaker, U. S. Commissioner of Education, dealt largely with the improvement of resident instruction. He advocated systematic research in the field and indicated a desire on the part of the Office of Education to exercise a constructive leadership with a corps of specialists available for studies and institutional cooperation.

Two essentials for the college graduate were visualized in an inspirational discussion by Dean Margaret M. Justin of Kansas. The first of these, she averred, is a specialized knowledge, which is being provided to the point of domination as a result of the impact of pressure groups. The second is the inculcation of broader values, for which great opportunity still remains.

Under the title of The Eternal Verities in the Operation of Vocational Education, President Thomas H. Quigley of the American Vocational Association pleaded for full cooperation by the land-grant institutions in the training of vocational teachers. The development of vocational training he regarded as the most hopeful remedy of unemployment, as well as a powerful factor in the maintenance of democratic ideas and ideals.

In the absence of the Secretary of Agriculture, Under Secretary M. L. Wilson brought greetings from the Department. He discussed the development of cooperative relations and in particular the new plan of organization which is being put into effect within the Department. Among other objectives, this plan is designed to bring into coordination the procedures under the legislation of recent years and to facilitate the formulation of action programs and other planning and the maximum of efficiency in their execution.

The history and achievements of the Office of Reclamation were set forth by its head, Commissioner John C. Page. He concluded his paper with a suggestion that the problems presented for agricultural development on the completed projects still constitute a special challenge to the land-grant institutions of the area.

An address by Dr. George F. Zook, president of the American Council on Education, dealt largely with the measure of control exercised over educational institutions by accrediting agencies. Such agencies he found to be becoming an increasingly powerful influence, though as yet least potent in agriculture and home economics. Because of the possibility of undesirable consequences from such control, he argued for a thoroughgoing study of accrediting methods, a stimulation of experimentation and a constructive philosophy of improvement rather than undue reliance upon mere standardization, and the maintenance of free choice of objectives by the institutions themselves.

In the section meetings the provision of adequate training for future workers was a leading subject of discussion. The opening session of the subsection of resident instruction was given over to the topic of training for public service in agriculture, and the section of home economics devoted an afternoon to undergraduate and graduate training desirable for home economics research and an evening to extension objectives as they relate to the training of extension workers. The engineering section took up the training of instructors for advancement, and the extension subsection the training of supervisors and county agents.

An indication of the steadily enlarging demands upon the land-grant institutions was afforded by several discussions of possible adjustments. One of these, adjustments to meet increased enrollment and changing conditions, occupied a session of the subsection of resident teaching, while the extension subsection gave much of its attention to problems of effective administration and supervision and program planning. Closely allied to this was the problem of division of time between experiment station and college work of staff members doing both research and teaching, discussed in the experiment station subsection by Directors W. A. Schoenfeld of Oregon and W. W. Burr of Nebraska and Mr. R. W. Trullinger, Assistant Chief of the Office of Experiment Stations.

An important question as to institutional responsibilities had to do with the development and administration of Federal agricultural planning programs. This topic was considered at one of the joint sessions of the three subsections of agriculture, where it was discussed by Dr. John M. Gaus of the Social Science Research Council, Director R. E. Buchanan of Iowa, and Mr. M. S. Eisenhower, Coordinator of Land Use Planning of the Department of Agriculture. The discussions brought out the unique opportunities and responsibilities of the land-grant institutions in securing and supplying basic information, the training of administrators and other public officials, and the rendering of assistance in the formulation of plans and policies, but some differences of opinion as to the extent of direct participation which these institutions should undertake in the administration of action programs.

The major research problems centered around the relationship between experiment station and general university research, the status of research into new uses and outlets for agricultural crops and products, the possibilities of providing more adequately and systematically for critical reviews and related bibliographical aids for research workers, and the determination of a balanced correlation between land planning and livestock in a land utilization program. Following the custom of recent years, it is planned to discuss these matters in greater detail in the February issue of the *Record*.

The report at the close of the convention by the chairman of the executive committee, President T. O. Walton of Texas, dealt almost exclusively with the legislative program of the association. The announcement of new officers revealed the advancement to the presidency of the former vice president, President J. A. Burruss of Virginia, the selection of President F. D. Farrell of Kansas as vice president, and the reelection as secretary-treasurer of Dean and Director T. P. Cooper of Kentucky. Aside from the substitution of Dean O. J. Ferguson of Nebraska for Dean O. M. Leland of Minnesota, the membership of the executive committee remained unchanged. A list of section officers and committee assignments appears on page 143 of this issue.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Outlines of biochemistry, R. A. Gortner (*New York: John Wiley & Sons; London: Chapman & Hall, 1938, 2. ed., pp. XX+1017, figs. 165*).—The author has completely rewritten considerable portions of the original text (E. S. R., 62, p. 201) and has added three new chapters dealing, respectively, with oxidation reduction, the flavines, and the hormones, together with a section on lignin.

Preservation of cyanogenetic plants for chemical analysis, R. R. Briese and J. F. Couch. (U. S. D A.) (*Jour. Agr. Res. [U. S.], 57 (1938), No. 2, pp. 81–107, figs. 2*).—Fresh cyanogenetic plants stored at ordinary temperatures without preservatives lost from 13 to 83 percent of their hydrocyanic acid in from 1 to 6 days.

Various preservative reagents and methods resulted in losses up to 96 percent of the hydrocyanic acid. On the other hand "mercuric chloride in water solution proved to be an excellent preservative when used in the proportion of 1 percent by weight for fresh plant. Specimens so preserved and stored for 6 mo. have shown no loss of hydrocyanic acid. Lower concentrations of mercuric chloride either did not preserve or led to variable results. A concentration of 2-percent mercuric chloride preserved dried plants reasonably well for 3 mo. With dried sorghums and for longer periods a higher, undetermined concentration would be required. Plants preserved with mercuric chloride generally yielded more hydrocyanic acid than when not so preserved except in certain cases in which the experiments may have been terminated before the maximum yield of hydrocyanic acid was obtained. In the concentrations used mercuric chloride retarded but did not stop enzyme action in cyanogenetic plants. Buffering did not counteract this effect, and the addition of chloroform did not accelerate enzymolysis. The addition of enzyme greatly accelerated the rate of hydrocyanic acid formation in the presence of mercuric chloride. . . . The optimum temperature for storage of samples preserved with mercuric chloride solution, as between a refrigerator at 9° C., the laboratory at 25°, and an incubator at 37°, was found to be 25°."

An analytical technic for recovering hydrocyanic acid from samples preserved with mercuric chloride was developed. To liberate hydrocyanic acid from mercuric cyanide, stannous chloride was found to be preferable to potassium iodide except in one instance. Mercurous iodide appears to be volatile with steam and to deposit in condensers, where it reacts with water to form mercuric iodide and metallic mercury. The mercuric iodide may render distillates turbid and interfere with the end point in titration.

"Large quantities of hydrocyanic acid are converted into other compounds when hydrocyanic acid is heated with very dilute acids. This results in an unavoidable error in the determination of hydrocyanic acid in plants."

The solubility of casein in salts of certain organic acids, and its fractionation by means of these acids, R. H. McKee and S. P. Gould. (U. S. D. A. et al.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 2, pp. 125–143*).—By exposure of casein, prepared by various methods, to the solvent action of 5-percent solutions of the sodium salts of benzene- and of cymene-sulfonic acid, and of 7.5-percent solutions of the last-named salt, all adjusted to pH 4.6, for a length of time sufficient to bring about a constant refractive index in the solution, the authors separated casein into soluble and insoluble fractions differing in phosphorus content, in the quantity of formaldehyde absorbed, and in the solubility of the fractions in 70-percent pyridine solutions. Potassium thiocyanate solutions effected no fractionation. It is noted that although qualitative fractionation was clearly shown, a quantitative fractionation was not obtained.

"The theory that casein is a mixture or a composite of loosely bound aggregates rather than a compound receives emphatic substantiation since a fractionation into constituents has been effected by the nearly neutral, nonhydrolyzing salts of organic acids." The fact that fractionation equilibrium was not dependent on time (as shown by the refractometer) is held to support the belief that casein is more probably a mixture of separate components than a composite of loosely bound aggregates.

A 2,4-dinitrophenylhydrazine derivative of dehydroascorbic acid and the estimation of vitamin C, J. H. Roe (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 3, pp. 465–467*).—In this preliminary report the author presents a method for the determination of vitamin C in urine, using 2,4-dinitrophenylhydrazine in N HCl. The dehydroascorbic acid osazone is reduced to a colorless compound by warming with 12 percent hydrochloric acid containing 10 percent stannous chloride and autoclaving until the dehydroascorbic acid is released from the compound and converted into furfural. The colorimetric aniline acetate method of determining the ascorbic acid as furfural, which was described previously (E. S. R., 77, p. 584), is followed. The method appears to be specific for vitamin C estimation.

A study of methods for the determination of acidity in butter fat, D. F. Breazeale and E. W. Bird. (Iowa State Col.). (*Jour. Dairy Sci., 21 (1938), No. 7, pp. 335–344*).—Methods are described for the titration of the free fatty acids in butterfat, using potassium hydroxide in absolute alcohol as a titrating agent. A comparison of the results secured by these methods with those by the A. O. A. C. and other methods showed good agreement. The titration end points were more easily observed, and best agreement between duplicate samples was obtained by the alcoholic potassium hydroxide method. An acid separation method is described by which from 94.6 to 99.4 percent of the weight of added acids were recovered with a high degree of purity.

Cucumber pickles, I. D. Jones and O. Veerhoff. (Partly coop. U. S. D. A.). (*North Carolina Sta. Rpts. 1936, p. 68; 1937, pp. 56, 57*).—Experiments on a commercial process are reported.

Further studies on preservation of apple juice by flash pasteurization, R. E. Marshall and J. C. Kremer (*Michigan Sta. Quart. Bul., 21 (1938), No. 1, pp. 12–17, fig. 1*).—The authors have extended a study noted in their preliminary report (E. S. R., 78, p. 9), describing in the present paper a flash pasteurizer characterized by a pasteurizing spiral of flattened block tin tubing. A similarly rapid or flash cooling of the pasteurized juice was found desirable in that the juice had a less markedly cooked taste, handling of the bottles was more convenient, and the juice when so handled as to be free from live organisms showed less tendency to develop sediment and cloudiness. The operations of pasteurizing and bottling with the new equipment are described in working detail.

AGRICULTURAL METEOROLOGY

Monthly Weather Review, [May–June 1938] (*U. S. Mo. Weather Rev., 66 (1938), Nos. 5, pp. 117–164, pls. 7, figs. 21; 6, pp. 165–203, pls. 7, figs. 21*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the article by Lothman noted below and the following contributions:

No. 5.—Precipitation in the Great Plains, by W. A. Mattice (pp. 117–126); A Study of the Hourly Precipitation at Oklahoma City, Okla., by H. F. Alexander (pp. 126–130); A Statistical Analysis of Summer Stratus Over South Texas, by M. E. Crawford (pp. 131–133); Synoptic Analysis of the Southern California Flood of March 2, 1938, by C. H. Pierce (pp. 135–138); and Southern California Rain and Flood, February 27 to March 4, 1938, by L. H. Daingerfield (pp. 139–143).

No. 6.—Frontal Movements Contrary to Indicated Gradient Flow Produced by Minor Waves, by A. K. Showalter (pp. 165–174); New Values for the Infrared Absorption Coefficient of Atmospheric Water Vapor, by W. M. Elsasser (pp. 175–178); and Psychrometric Charts, by J. G. Albright (pp. 178–181).

Standard seasons, M. JEFFERSON (*Ann. Assoc. Amer. Geog., 28 (1938), No. 1, pp. 1–12, figs. 9*).—The author of this publication divides the world's peoples into 6 groups distributed with reference to seasonal differences to which they are subjected and react. It is stated that 1,159,000,000 people of interest in this connection, viz, those who invent, make, and use the things we want, live where standard winter comes and know something of snow and ice, and 854,000,000 live in frostless regions. The first group has an average density of population of 148 to the square mile, the second a population density of but 48 per square mile.

Sunspots and their effects, H. T. STETSON (*New York and London: McGraw-Hill Book Co., [1937], pp. XV+201, [pls. 3], figs. [13]*).—Feeling that "perhaps all too long has the reading public been dependent upon the technical material in textbooks on astronomy for a knowledge of sunspots," the author attempts a popular presentation of the subject. The character and scope of the book is indicated by the chapter headings: The sun; sunspots and human behavior; sunspots and growing things; sunspots and radio; sunspots and business; measuring sunlight; weather and sunspots; solar utilities, power, and light; of sunspots, the earth's magnetism, and carrier pigeons; where sunspots grow; can we predict sunspots?; what makes sunspots?; and alongside Singapore—a résumé. An appendix gives Wolf and Wolfer sunspot numbers for each year from 1749 to 1937, inclusive, with annual means.

Weather forecasting [trans. title], P. BERGER (*Arch. Sci. Phys. et Nat. [Genève], 5. ser., 19 (1937), Sept.–Oct., pp. 203–222, figs. 2; abs. in Sci. Abs., Sec. A—Phys., 41 (1938), No. 482, p. 136*).—Charts prepared from observations on pressure, temperature, humidity, and wind at the surface of the earth and by means of airplanes from the ground to a height of 6,000 m are considered the best basis for forecasting so far devised.

Fog forecasting for fire control in southern California, A. A. LOTHMAN (*U. S. Mo. Weather Rev., 66 (1938), No. 5, pp. 134, 135, figs. 2*).—This practical method, worked out at the Pasadena office and here described, for forecasting the extent to which fog will form inland is based on the Petterssen[1] theory that "the air which produces fog is unstable and the fog or stratus forms because of convection under the temperature inversion separating the Pacific air from the dry air aloft. Outgoing radiation from the top of the moist layer is effective in maintaining the temperature inversion and the instability of the air." The method is considered reliable whenever the height of the base of the inversion can be closely determined, and when a fall in temperature below that necessary to produce fog is predictable. The forecasts, for use in forest fire control and made every evening, have proved highly successful over a 4-mo. trial.

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[1] Jour. Aeronaut. Sci., 3 (1936), No. 9, pp. 305–309, figs. 3.

The prediction of minimum temperature on clear days from the maximum temperature and vapour pressure of the previous afternoon at a number of representative stations in India, M. Narasimhan (*Indian Sci. Cong. Proc.* [*Calcutta*], *24* (*1937*), *p. 357*).—In the study here reported it was found that "the minimum temperature is associated with the maximum temperature and the water vapor content of the air during the previous afternoon. This is to be expected because the cooling of the air layers near the ground during the clear nights decreases with increase in the water content of the atmosphere. Regression equations for 17 selected stations in India have been worked out. These are of the form $N=A+BX+CV$, where N is the minimum temperature, X and V are the maximum temperature and the vapor pressure, respectively, of the previous afternoon, and A, B, and C are constants which vary with the station." The results are considered to be of great value in the prediction of abnormally cold temperatures during winter.

The extremes of the annual temperature march, with particular reference to California, J. Leighly (*Calif. Univ. Pubs. Geog.*, *6* (*1938*), *No. 6*, *pp. 191–234*, *pls.* [*5*], *figs.* [*13*]).—This publication deals with methods and results of investigations of the heat economy of the lower atmosphere, the regional water economy, and the annual energy balance. The consequences of the operation of physical processes known to be active are noted, and the observational data are critically examined for the features to be expected from theoretical considerations, the functions of the annual temperature march subjected to special scrutiny being the differences in date between the maximum and minimum solstices, the extremes of the annual march of insolation.

Agricultural meteorology: Correlation of monthly precipitation in central and southern Alberta and Saskatchewan with latitude, longitude, and altitude, J. W. Hopkins (*Canad. Jour. Res.*, *16* (*1938*), *No. 5*, *Sect. C*, *pp. 214–224*).—Continuing previous studies (E. S. R., 78, pp. 301, 754), this article reports and discusses "the linear partial regression coefficients of the 19-yr. average (1917–1935) monthly precipitation recorded at 42 points in central and southern Alberta on latitude, longitude, and altitude. . . determined for each month of the year. The correlation of precipitation with these co-ordinates, although statistically significant, was only moderate. Some improvement was effected by inclusion of the quadratic term in longitude, but even so more than 50 percent of the interstation variance of the 19-yr. precipitation averages for most months remained in the form of residual deviations. Observations for individual years were even less amenable to graduation. Consequently, a given number of meteorological stations would provide a much less complete specification of precipitation than of air temperature (the subject of a parallel previous study) within the area considered."

Rainfall and tree growth in the Great Basin, E. Antevs, edited by **J. K. Wright** (*Carnegie Inst. Wash. Pub. 469* (*1938*), *pp.* [*5*]+*97*, *pls. 2*, *figs. 7*; *also Amer. Geogr. Soc. Spec. Pub. 21* (*1938*), *pp.* [*5*]+*97*, *pls. 2*, *figs. 7*).—This publication is divided into two parts, rainfall fluctuations during the past hundred years and tree growth in relation to rainfall. Rainfall fluctuations are given for Lake County, south-central Oregon; the Great Basin region of northeastern California: Modoc and Lassen Counties; the Truckee-Carson-Walker region, western Nevada; the Humboldt region, northern Nevada; and the Great Salt Lake region, Utah, and the significance of the fluctuations is discussed. Observations on tree growth in relation to rainfall and water supply are given for Susanville, Calif., and Lakeview, Oreg., with a discussion of their significance. It is pointed out that tree growth is affected by local circumstances such as deficient precipitation, a very dry and rather warm summer, and perhaps ravages of insects. For these reasons the author believes that "serious mistakes may be made when rainfall cycles are solely postulated on the analysis of tree ring records. While tree ring curves . . . when taken alone permit only general and somewhat conditional conclusions concerning past rainfall fluctuations, they acquire greater significance when supported by other types of evidence."

Some correlations between vegetation and climate in New Zealand, V. D. Zotov (*New Zeal. Jour. Sci. and Technol., 19 (1938), No. 8, pp. 474–487, figs. 2*).—The author's summary says: "The views expressed in this paper are founded in the main on observations for a number of years on the Tararua Mountains. For altitudinal distribution it is proposed to define belts according to the distribution of species rather than of communities, and to designate the belts according to temperature rather than altitude. Evidence is given that the belts are determined by summer temperatures and not by duration of winter snow. This is illustrated by a study of the altitudinal distribution of *Nothofagus* and of the causes of the timber-line. Further evidence in support is drawn from various localities in New Zealand. . . . The peculiarities of each district are shown to be due to differences of summer temperature and rainfall."

Pedologic evidence of changes of climate in Michigan, J. O. Veatch. (Mich. Expt. Sta.). (*Mich. Acad. Sci., Arts, and Letters, Papers, 23 (1937), pp. 385–390, pl. 1, figs. 3; abs. in Michigan Sta. Quart. Bul., 21 (1938), No. 1, p. 64*).—The author's observations lead him to believe that the soil profiles of the State exhibit as many features from past as from present climates. There are dry, hardwood podsols, profiles characteristic of waterlogged podsols and swamp soils but now on dry sites, oxidized red clayey B horizons typical of a climate warmer than the present, and dark-colored humus soils developed under a grass or treeless cover. A hypothetical curve of postglacial climate in Michigan is presented.

Some interrelationships between soil characteristics, water tables, soil temperature, and snow cover in the forest and adjacent open areas in south-central New York, J. N. Spaeth and C. H. Diebold (*[New York] Cornell Sta. Mem. 213 (1938), pp. 76, figs. 14*).—Drifting appeared to be the most important factor in the distribution and accumulation of snow in exposed areas. Forest cover, as compared with bare fields and herbaceous cover, greatly reduced it, favoring a deep, well-distributed snow cover. During the flood period there was less than 1° F. difference in the mean daily temperatures between forest and nearby open-field stations. The depth of snow by which forest stations exceeded open-field stations during February was about equal to the depth of snow at the former when the open fields became bare. Very light rainfall is said to maintain water tables on Volusia, Nardin, and Canfield soils from late fall to early spring, whereas heavy rainfall is necessary from late spring to early fall.

The temperatures of greatest importance for silvicultural management and reforestation are the average maximum and minimum soil temperatures for short periods, supplemented by the absolute maxima and minima. Presence or absence of forest cover is the most important modifying factor during summer. The effect of differences in exposure on maximum soil temperature was limited largely to the first few inches in midsummer, especially in forest areas. The studies the author confirmed the same two types of reaction to indoleacetic temperatures favorable to rapid root growth occurred from mid-May to early October. A 7-in. depth of snow was insufficient to prevent the freezing of soil to a depth of 30 in. at a bare-field station during the coldest month encountered, while 10–17 in. prevented freezing at 6 stations with grass and weed cover, and none occurred at 12 forest stations with snow depths at 17–31 in. The presence or absence of perched water tables had no important effects.

Surface-soil temperatures injurious to forest-tree seedlings are believed to be rare on the heavy-textured soils of the region, and to be limited to bare areas. Serious heaving was confined to open fields with high water tables for long periods during freezing weather. Such areas should not be reforested until successful methods are developed. Moderate improvement cuttings resulted in only a slight increase in the temperature of the humus layer in midsummer, and had little or no such effect on the mineral soil. The influence on forest-tree growth of wide differences in height and duration of water tables was not striking.

Nineteen soil separations were combined into five groups separated on the basis of depth to the upper limits of mottling and depth to bedrock. These soil characteristics were directly related to seepage run-off, type of humus layer, rooting, and heaving. The zone of heavy-to-fair rooting was 2–3 times as great on moderately and well-drained soils as on those imperfectly drained. Surface run-off from frozen soils appeared to be one of the chief sources of winter and spring floods in the area. The extent of these frozen areas may be reduced by reforestation. Heavy seepage run-off from imperfectly to moderately drained soils occurred before, during, and after the peak of the March (1936) flood. Reforestation on these soils would be of value. Well-drained soils are so permeable that seepage run-off rarely occurs. Reforestation here would be of considerable value, since these soils, protected by forest cover, serve as natural reservoirs.

The climate of southern Ontario, D. F. Putnam and L. J. Chapman (*Sci. Agr., 18 (1938), No. 8, pp. 401–446, figs. 40*).—It is stated that while the climate of southern Ontario is usually defined as of the modified humid continental type, actually the region is a borderland in which a number of different types of climate merge. The purpose of the study here reported was to analyze and describe these types in sufficient detail and in such a way as to be an aid in making correlations with crop growth. To facilitate the study a series of isopleth maps were made and are given in the paper. On the basis of topography, location, and coincidence of isopleth lines southern Ontario has been divided into 15 regions, which are described.

[Meteorological records] (*Georgia Coastal Plain Sta. Bul. 28 [1937], pp. 13, 14*).—Rainfall in inches by months and years (1923–36), dates of first and last killing frosts and number of growing days per year (1923–36), and temperatures by months (1936) for Tifton, Ga., are tabulated.

SOILS—FERTILIZERS

[Soil and fertilizer investigations by the Idaho Station], H. P. Magnuson, K. H. W. Klages, W. V. Halversen, and J. Toevs. (Partly coop. U. S. D. A.). (*Idaho Sta. Bul. 225 (1938), pp. 10, 27, 28, 33, 34, 68*).—Soil and fertility experiments, including a comparison of various phosphorus carriers, the use of legumes, and the improvement of sodium-saturated "slick" soils; bacteriological studies of north Idaho soils; relation of nitrates to nodule formation; and tests of liquid ammonia as a fertilizer are briefly reported upon.

[Soil and fertilizer work of the North Carolina Station]. (Partly coop. U. S. D. A. et al.). (*North Carolina Sta. Rpts. 1936, pp. 13–16, 18, 19, 20; 1937,* *pp. 17–20, 28, 30, 31*).—The work reported consists of chemical research on soil fertility problems, effect of copper, manganese, and phosphates, the use of organic ammoniates in fertilizers, reductivity intensity in soils as evidenced by soil potential drifts, boron deficiency in North Carolina soils, stimulative function of organic matter, and magnesia deficiencies of some sandy soil types, all by L. G. Willis and J. R. Piland; a laboratory investigation of certain inherent soil properties which affect the erosiveness and fertility of soils, by J. F. Lutz; phosphate experiments in cooperation with the T. V. A., by C. B. Williams and W. W. Woodhouse; triple superphosphate experiments and fused phosphate experiments, both by Woodhouse; and phosphorus sources for Cecil clay and sandy loam, by Williams, W. H. Rankin, and J. W. Hendricks.

The idea of the natural land type, J. O. Veatch. (Mich. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 2* (*1937*), *pp. 499–503, figs. 2*).—The differentiation of land surfaces into natural divisions which are complexes, or associations, of soils and relief features is discussed. The name pedonomorphic for such divisions is proposed. On the basis of a critical study of the soil survey maps of the U. S. D. A. Bureau of Chemistry and Soils, the conclusion is reached that the soil types as at present differentiated may be regarded in part as minor natural land types, but that the same soil type is not everywhere the same land type. The natural land type is more inclusive of the natural factors, which influence the use and value of land, than is the soil type alone.

Physical characteristics of the soil profile as applied to land classification, T. D. Rice. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 1* (*1936*), *pp. 455–458*).—The author takes up the significance of soil color, defines texture and structure as profile characteristics, and notes the importance of this and related soil characteristics determined by profile study in the appraisal of a soil for land classification purposes. Physical properties are admitted to be by no means a complete or sufficient basis for a full land use appraisal, but "through all changing social and economic conditions, the selection of crops and the methods of farming will be subject to the limitations imposed by the soil. The success of any crop must depend on its ability to make use of the favorable characteristics of the soil and to tolerate the unfavorable. In this respect, a knowledge of the physical characteristics of the soil is fundamental in any system of land classification for use."

Chemical characteristics as factor in determination of class and use of land, G. W. Conrey. (Ohio Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1* (*1936*), pp. *459–462*).—This contribution points out that among the most important of the chemical relationships in land classification are the reaction of the soil and the content of organic matter, and that the exchange capacity, degree of saturation with bases, and the character of the exchangeable bases and the level of productivity from the standpoint of available plant nutrients must also be considered. "The use of the so-called quick tests should aid greatly in this regard, but much is still to be desired in their interpretation. It is essential that the tests be calibrated in terms of crop and soil conditions."

A system for correlation of land forms and covers with soil classification, G. L. Fuller. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 1* (*1936*), *pp. 463–468*).—For the purposes of a soil conservation inventory survey map the author records as of primary importance the four factors, (1) soil type, (2) present land use or ground cover, (3) slope, and (4) character and degree of erosion. For soil type the standardized soil classification already in use is utilized. Land use or cover is indicated by the four primary classes of cultivated, pasture or range, forest, and idle lands. The classes are designated and subdivided by symbols: "Thus, L is the symbol for cultivated land generally, but L1 may indicate small grain, L2 corn, L3 an orchard, etc." Slopes are designated A, B, C, or D, with suitable subdivisions, according to the percentage of slope and the relative erosibility of the soil material itself. "Accelerated erosion," defined as "that erosion which has increased above that which existed under natural environment, due either to the destruction of vegetative cover or to some activity of man," is dealt with by means of a series of numerical symbols for the types and degrees of water erosion and for wind erosion (divided into the two categories of removals and accumulations) a series of literal symbols. Modifications of the erosion symbols permit indicating active, partially stabilized, or completely stabilized erosion of each variety.

Some general aspects of the Chernozem formation, C. C. Nikiforoff. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 333–342, fig. 1*).—The author sets forth as specific and dominant characteristics of Chernozem soils a high content of humus in the A horizon, an accumulation of carbonates in the B horizon, and a saturation of the colloidal complex "by the metallic ions, among which the ions of calcium are by far the most significant." The three processes of humification, carbonate accumulation, and calcification, "or saturation of the soil colloidal complex predominantly by the ions of calcium and to less extent by the ions of magnesium," are analyzed in some detail.

With respect to humus formation it is noted that although not infrequently the process is spoken of as an accumulation of organic matter, "such a definition . . . is hardly correct, as a continual progressive accumulation of humus scarcely exists. Theoretically, one may assume that a gradual increase in the amount of humus proceeds in a relatively young soil with geometrically decreasing speed until a certain equilibrium between the rate of income of the newly formed humus and the rate of its mineralization is reached. After this time, the amount of humus in the soil will remain constant unless some changes of the environment disturb the equilibrium."

The formation of a horizon of carbonate accumulation, in which the carbonates may be present in higher percentages than in the parent material and are found regardless of the character of the parent rock, is attributed to a balance between capillary rise and deposition on the one hand and leaching on the other.

[Soil Survey Reports, 1932, 1933, and 1934 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils* [*Soil Survey Rpts.*], *Ser. 1932, No. 28, pp. 42, pl. 1, figs. 3, map 1; 1933, Nos. 18, pp. 33, pls. 2, figs. 3, map 1; 19, pp. 53, figs. 3, map 1; 21, pp. 28, figs. 2, map 1; 1934, Nos. 6, pp. 40, figs. 2, map 1; 7, pp. 78, pls. 3, figs. 2, map 1; 8, pp. 27, figs. 2, map 1*).—Except as indicated below, these surveys were made in cooperation with the respective State experiment stations: 1932, No. 28, Woodward County, Okla., E. G. Fitzpatrick and W. C. Boatright; 1933, Nos. 18, Carter County, Okla., E. G. Fitzpatrick and W. C. Boatright, 19, Saginaw County, Mich., J. W. Moon et al., and 21, Vinton County, Ohio, A. H. Paschall et al.; and 1934, Nos. 6, Marion County, Miss., J. W. Moon et al. (Miss. Geol. Survey), 7, Onondaga County, N. Y., W. J. Latimer et al. ([N. Y.] Cornell), and 8, Gosper County, Nebr., W. J. Moran (Univ. Nebr.).

Vermilion County soils, H. Wascher and R. S. and L. H. Smith (*Illinois Sta. Soil Rpt. 62 (1938), pp. 36, pls. 3, figs. 14*).—This survey of Vermilion County has added a further 566,970 acres to the total area examined in the State soil survey (E. S. R., 78, p. 161.)

Some impressions of British soils, C. F. Shaw. (Calif. Expt. Sta.). (*Jour. Southeast. Agr. Col., Wye, Kent, No. 38 (1936), pp. 27–30*).—The author of this contribution was "impressed [at the Third International Congress of Soil Science] with the amount of chemical and physical data that was presented to explain and illustrate the many profiles that were exposed in the fields visited during our excursion" and by the extensive laboratory study, well planned and highly illuminating. He "missed, however, the cartographic aspect."

The soils seen during the post-Congress excursion are all placed by the author tentatively in the podzolic group, none in the "Braunerde." He notes that "some of them are definitely Podzols, others show some of the podzolic characteristics in color, while some do not show the color evidence but probably will show in chemical constitution and distribution of silica, sesquioxides, and colloids the characteristics of the podzolic type of weathering."

Relative productivity of soils in Arkansas, R. P. Bartholomew and O. R. Younge (*Arkansas Sta. Bul. 365 (1938), pp. 39, fig. 1*).—This report is based on data which have resulted from investigations dealing with the determination of the relative productivity of different soils types, and the factors which influence productivity. "The results and conclusions are tentative in character and may be altered or modified by results of more detailed investigations as further data become available for publication."

Provisional problem areas in soil conservation research in the United States, E. A. Norton, R. V. Allison, and G. D. Scarseth (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 495–503, pl. 1*).—A brief preliminary report tabulates 80 of those areas already sufficiently studied to permit of their classification in the groups of serious, moderate, and slight conservation difficulty. Of each area or land class so tabulated the topography, climate, original vegetation, predominant land use, years of predominant land use, type of erosion, soil characteristics, and principal soil series are shown.

Effect of soil characteristics on plant development in relation to water conservation, M. R. Huberty. (Calif. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 439–446*).—The author of this contribution discusses availability of soil moisture to plants, cultivation, organic matter, soil temperature, soil organisms, soil solution, soil air, and texture, structure, and profile development with respect to their influences upon plant moisture and in the light of information derived from the more than 70 papers cited.

Soil characteristics influencing the movement and balance of soil moisture, L. D. Baver. (Mo. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 431–437, figs. 3*).—The author presents a discussion designed to point out that the soil plays a major role in the hydrologic cycle, and states that it is necessary to evaluate the complex variable of soil-water movement in its relation to soil properties before a thorough understanding of water conservation and erosion control is possible.

Studies on soil structure: Effect of puddled soils on plant growth, W. T. McGeorge and J. F. Breazeale (*Arizona Sta. Tech. Bul. 72 (1938), pp. 411–447, figs. 12*).—Soil structure may be seriously injured by the vibration of heavy farm implements. The structure of a puddled soil can be rebuilt and productivity restored by a dry fallow. The structure will also be improved by applying a dust mulch to the wet puddled soil, and accompanying this there will be an improvement in plant growth and absorption of plant food by plants grown thereon.

Seed will not germinate in a puddled soil unless it is located near a soil crack or other surface where it can obtain air. One of the principal effects of a puddled state is a reduction in the availability of soil moisture, which is much lower than in waterlogged soils. When organic matter is allowed to decompose in puddled soils, toxic substances will be formed which may seriously reduce their productivity, and even after the structure has been rebuilt by a dry fallow the toxic condition will still exist. The availability of phosphate, potassium, calcium, and nitrogen is materially reduced by soil puddling. This is true of these elements when naturally present in the soil as well as those added as commercial fertilizer.

Hydrologic interrelations of water and soils, R. E. Horton (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 401–429, figs. 8*).—In this systematic analysis of available information and needed investigation the author's main object has been "to point the way whereby empirical or purely statistical analyses of water-soil relationships may be replaced by studies along the lines of the physical processes involved."

Surface run-off phenomena are considered with reference to a unit strip, a strip of ground of unit width following the slope from the watershed line to an outflow channel. "In other words, this paper deals with microhydrology as distinguished from the more usual macrohydrology, which deals with entire drainage basins or other geographic areas.

"One important result is that conclusions derived from run-off plat experiments cannot always be directly applied to larger areas. Such experiments will give correctly the infiltration capacity and volume of depression storage for a larger similar area, but since velocity of overland flow, depth of surface detention, total run-off, and soil erosion vary with length of overland flow, the results of plat experiments must be multiplied by a scale factor to make them applicable to larger areas."

Conservation and use of soil moisture at Mandan, N. Dak., J. C. Thysell (*U. S. Dept. Agr., Tech. Bul. 617 (1938), pp. 40, figs. 4*).—Soil moisture was determined for 20 yr. in 1-ft. sections to a depth of 6 ft. on land cropped to wheat and corn under different cultural methods and on two soils of widely different texture and water-holding capacities. Storage and use of soil moisture are recorded on the basis of divisions of the year into two major periods, designated as growing and dormant periods, and four minor periods, seeding to early June, early June to harvest, harvest to late fall, and late fall to seeding. Water determined as a percentage of the dry weight of the soil is converted to inches by the formula

$$\text{inches of water per 1-ft. layer}=\frac{mw}{5.196},$$

in which m is the percentage of water and w is the weight of a cubic foot of soil. One-half the quantity of water represented by the moisture equivalent to a depth of 6 ft. is designated the normal point of field reduction, and water above that quantity is used as the quantity available for crop use. Averages of from 2 to 5 in. more water were available under alternate cropping than under continuous cropping. From 1 to 2 in. more water was available under all conditions in the light soil than in the heavy soil. Field water requirement, based on the difference in the water content of the soil at seeding and harvest times plus the precipitation during that period, is stated in terms of acre-inches of water used in the production of 1,000 lb. of field-cured crop. During the whole fallow period 20 percent of the precipitation was saved. The gain or loss in the water content of the soil during minor parts of the fallow period appeared to be definitely identified with specific conditions of surface cover or soil. An average saving of 1 in. of water by plowing fallow June 1 instead of July 1 resulted in an increase of 6.6 bu. of wheat per acre.

The nature and controlling variables of the water erosion process, H. L. Cook. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 487–494*).—The author, in an analysis of the erosion problem from the viewpoint of necessary soil conservation research, finds the following to be the principal variable factors in the water-erosion process: Soil erosibility, climatic erosivity, infiltration capacity, surface storage capacity, degree of slope, length of slope, and cover protectivity. Although "obviously research into the fundamentals of the erosion process must consist principally of studies of these variables," the author emphasizes that "it was not intended to infer that research into the fundamental nature of the erosion process constitutes a complete program of soil conservation research. Such a program would involve the study of (1) the fundamentals of the process, (2) methods of erosion control, [and] (3) the reclamation of eroded soils."

Technology of erosion control, M. L. Nichols. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 393–399*).—This discussion takes up general principles of erosion control; field practice in various areas, including the Coastal Plains, the Black Belt of Alabama and Mississippi, and the Piedmont area; and general applications of the erosion control technics which have arisen under the various local conditions considered.

Effect of neutral salts of sodium and calcium on carbon and nitrogen of soils, V. P. Sokoloff. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *57 (1938), No. 3, pp. 201–216*).—Results of transformations of the volatile and soluble products of bacterial action from aerated soils treated with the sulfates and chlorides of calcium and sodium were found to support the conclusions that "(1) the release of nitrate and of total nitrogen, as well as of the soluble and volatile forms of carbon, is stimulated, often to a great extent, by the sodium salts and depressed by the corresponding calcium salts, regardless of aeration; (2) presaturation of the soil with sodium tends to emphasize the stimulating effects of the sodium salts; [and] (3) the carbon: nitrogen ratio of the undissolved organic matter of the soil is lower in the sodium-treated than in the calcium-treated aerated soils."

An apparent induced loss of nitrogen-fixing ability in Azotobacter, C. R. Stumbo and P. L. Gainey. (Kans. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *57 (1938), No. 3, pp. 217–227, fig. 1*).—The authors show that prolonged growth of *Azotobacter* in the presence of relatively high concentrations of potassium nitrate resulted in such an alteration in the physiological make-up of certain strains of the organisms as to render them incapable of growing normally in the absence of combined nitrogen. Such a condition was reflected in very limited or no visible growth, inability to metabolize atmospheric nitrogen, or a combination of both conditions. It is believed that the effect of the potassium nitrate was due to the nitrogen since potassium ions supplied in other salts did not have a similar effect. Limited experimentation with other nitrogenous compounds indicated that they would give similar results provided the nitrogen was available to *Azotobacter*.

[Abstracts of papers later presented at the Fertilizer Chemistry Division meeting, American Chemical Society, Rochester, N. Y., 1937] (*Amer. Fert., 87 (1937), No. 5, pp. 5–8, 9, 24*).—These abstracts include work of the State experiment stations and the U. S. Department of Agriculture as follows: The Evaluation of the Influence of Nitrogenous Fertilizers on the Acid-Base Status of Soils by Lysimeter Studies, by M. F. Morgan and E. M. Bailey (pp. 7, 8) (Conn. [New Haven]); Some Results of Rapid Soil Testing in Maryland, by R. P. Thomas, L. Golden, and N. Gammon, and The Effect of Different Extracting Solutions Used in Quick Tests Upon the pH Values and Soluble Elements Extracted From Some Maryland Soils, by N. Gammon and R. P. Thomas (both p. 6) (both Md.); What Is the Value of Rapid Soil Tests for New Jersey? by A. W. Blair (p. 5), and The Influence of Magnesium Treatment on the Calcium and Magnesium Content of the Crop, by A. W. Blair and A. L. Prince (p. 8) (both N. J.); Changes in Composition of Granular and Powdered Fertilizers in the Soil, by C. B. Sayre and A. W. Clark (pp. 9, 24) (N. Y. State); Short Chemical Soil Test as a Basis for Fertilizer Recommendations for Vegetable Crops on Coastal Plain Soils, by J. B. Hester (p. 5), and The Reliability of Rapid Chemical Plant Tests as Means of Diagnosing Fertilizer Deficiencies in Vegetable Crops, by R. L. Carolus, J. B. Hester, and J. M. Blume (p. 6) (both Va. Truck); Advances in Soil Testing (Soil Testing Marches On), by E. Truog and H. H. Hull (pp. 6, 7), and Reactions Between Soil and Fertilizer Constituents (When Soil and Fertilizer Meet—What Happens?), by E. Truog (p. 7) (both Wis.); and An Accelerated Caking Test for Fertilizers, by J. R. Adams (pp. 8, 9), and Factors Affecting the Granulation of Fertilizer Mixtures, by J. O. Hardesty and W. H. Ross (p. 9) (both U. S. D. A.).

"Soil fertility experiments with vegetable crops," M. F. MORGAN. (Conn. [New Haven] Expt. Sta.). (*Conn. Veg. Growers' Assoc. Rpt., 1936, pp. 63–67*).—The author reports upon 7 yr. of fertilizer experiments with 12 vegetable crops at Windsor. During the last 2 yr. an added experiment has been made with 45 lb. per acre of nitrogen applied as an early spring top dressing of cyanamide on a rye cover crop, and the remaining 45 lb. of nitrogen applied just before planting in the form of about 15 lb. each of nitrate, ammonium, and organic nitrogen. "The experiment with cyanamide indicates that it would be a good practice to place at least a part of the annual nitrogen application as a top dressing on a nonlegume cover crop which is to be plowed under. This procedure gives a more permanent organic residue and prevents possible injury due to the tying up of soluble nitrates during decomposition of a low-nitrogen material, such as rye."

Trials of a series of organic materials used as soil amendments in an area of poor sandy soil for 3 yr. indicated that stable manure, dried cow manure, commercial native peat, and tobacco stems are all quite effective, especially when used in connection with a moderate fertilizer application (1,000 lb. 5–10–5 per acre). Ground tobacco stems gave especially good results, and at current market price were much cheaper per unit of organic matter than the others, besides supplying very considerable quantities of potassium.

Experiments to determine optimum soil reactions for various vegetables were begun in 1936. Carrots grew best at pH 5.8 and were a practical failure at pH 5.0. Eggplants grew satisfactorily at pH 5.0 but showed a 15 percent increase in yield at pH 5.4. Above pH 5.4 yields gradually declined, with a definitely poorer result at pH 6.6.

Fertilizer developments in Mississippi, E. B. FERRIS. (Miss. Expt. Sta.). (*Better Crops With Plant Food, 22 (1938), No. 2, pp. 14, 15, 37, 38, fig. 1*).—The author has found, in fertilizer application tests at Holly Springs, that complete fertilizers gave increases even on the Delta soils of Mississippi, considered the most fertile in the State. Some specific results of fertilizer experiments on Lintonia silt loam are presented.

Using soil tests to get the picture, T. H. BLOW (*Better Crops With Plant Food, 22 (1938), No. 2, pp. 16–18, 36, figs. 3*).—In an examination of 913 soil samples from farms in all of the 17 towns in Caledonia County, Vt., the author found a close correlation between rapid chemical tests and fertilizer needs as indicated by actual crop results. Tables of recommended applications per acre of potassium calculated as K_2O, of phosphorus as phosphoric anhydride, and of nitrogen give rates for clay and loam and for sand and sandy loam soil groups, with separate recommendations for alfalfa, for clover and timothy, for permanent pasture, and for seeding down on each of the two groups of soils, and with seven rates of application, based upon extra high, very high, high, medium high, medium, low, and very low soil tests, for each soil-crop combination in the potassium and phosphorus tables. A similar nitrogen table covers the six ratings from very high to very low.

Rapid chemical tests show soil needs, S. F. Thornton. (Ind. Expt. Sta.). (*Better Crops With Plant Food, 22 (1938), No. 2, pp. 6–8, 42–46, figs. 3*).—The author finds that the extensive use of rapid chemical soil tests in Indiana has had an important influence on lime and fertilizer recommendations and use. He notes tendencies toward the recommendation and use of larger applications of limestone, the recommendation of some fertilizer for a larger proportion of all soils and crops, and the use of a higher proportion of potash to phosphorus, particularly for corn and legumes. The analysis most commonly recommended for corn and alfalfa at the present time is 0–12–12 or 0–20–20 instead of 0–14–7, and in many instances 3–12–12 is replacing the 2-12-6 formerly recommended for tomatoes. These are the analyses suggested for corn, alfalfa, and tomatoes on soils testing low or very low in both phosphorus and potassium, the condition most often found when Indiana soils are tested. "In actual practice . . . the use of the analyses suggested . . . is simplifying the problem of fertilizer recommendations, tending to reduce the number of analyses used in the State and contributing to better fertilizer practices."

Interrelation between fertilizer analyses and placement on the yield and growth of certain vegetable crops, M. M. Parker. (Va. Truck Expt. Sta.). (*Natl. Joint Com. Fert. Appl. Proc., 12 (1936), pp. 13–18, figs. 2*).—The tests reported were made under field conditions on a Norfolk sandy loam soil low in organic matter, nitrogen, phosphorus, and potash. The reaction of the soil was pH 5.6. Five fertilizer mixtures were used, including a 6–0–5, a 6–6–5, a 6–12–5, a 6–6–0, and a 6–6–10. Snap beans, cabbage, and lima beans were used as test crops. On the snap beans the three placements consisted of (1) broadcast fertilizers, (2) in bands 2 in. away from the seed and 2 in. below the seed level, and (3) in a band about 4 in. wide and 3 in. below the seed level. On the lima beans three additional placements were included, side dressing the beans after germination was nearly complete, placing the fertilizer on top of the row immediately after planting, and no fertilizer treatment. The fertilizers for both crops were used at the rate of 1,000 lb. per acre. The four fertilizer placements used on the cabbage crop consisted of (1) 1,000 lb., or its equivalent, of fertilizer placed in a broad strip and thoroughly mixed with the soil before transplanting, plus an additional 1,000 lb. as a side dresser when the transplants showed evidence of renewed growth; (2) 2,000 lb. applied in a broad strip and mixed with the soil before transplanting; (3) 1,000 lb. placed in bands 2 in. away from the plant and 3 in. below the soil surface, plus 1,000 lb. as a side dresser as in (1); and (4) 2,000 lb. applied in bands on each side of the plant.

No one placement or fertilizer formula was shown to be consistently best for all three crops. Placing the fertilizer as a band under the seed gave the poorest yield of both types of beans. The fertilizer containing potassium chloride equivalent to 10 percent potash depressed the germination of the snap beans when either placed below the seed or broadcast. Five percent potash equivalent depressed germination when placed below the seed but not when broadcast.

Present trends in fertilizer usage, R. E. Stephenson. (Oreg. Expt. Sta.). (*Better Crops With Plant Food, 21 (1937), No. 4, pp. 21, 22, 35, 36*).—The author finds a marked increase in the use of mineral fertilizers but considers the increase to be, in many cases, not sufficient to keep pace with the depletion of natural supplies of plant nutrients.

"Future crop yields in a given locality depend upon adequate evaluation of three important controllable yield factors—(1) tillage, including proper seedbed preparation and planting and weed control after planting; (2) crop rotation, which introduces a sufficient number of sod-crops to hold the soil and renew the humus; [and] (3) fertilization and liming to grow desirable types of crops and obtain yields that are profitable."

Granulated fertilizers, C. B. Sayre. (N. Y. State Expt. Sta.). (*Natl. Joint Com. Fert. Appl. Proc., 12 (1936), pp. 117–120*).—This contribution points out that although fertilizers or liming materials of very low solubility are much more effective in powdered form, such materials as superphosphate and salts of potassium "being already in a soluble and readily available form it is necessary, . . . in some soils, to devise means of protecting . . . readily available fertilizer from too rapid fixation or reversion to insoluble forms in the soil. . . . This rapid fixation can be overcome by two methods: (1) Placement of fertilizers in concentrated bands close to the plant [and] (2) by increasing the size of the fertilizer particle."

Tomatoes having been used as test crop in the preliminary (1 yr.) experiments here briefly reported upon, it is shown that, in the use of 600 lb. per acre of 5–10–5 (mineral nitrogen), 5–10–5 (nitrogen mostly in the organic form), and 4–16–4, as well as in the application of 16 percent superphosphate alone, "with each of the three different fertilizer formulas, when applied broadcast, the largest yields were obtained from the granulated form. With two of the three fertilizers, the granulated form also gave larger yields than the pulverized form when applied in concentrated bands 2½ in. to each side of the row and 3 in. deep. [The exception was the organic nitrogen 5–10–5.] With all three fertilizers, both in granulated and pulverized forms, larger yields were obtained where the fertilizers were applied in bands as compared with the broadcast application." The author emphasizes that "these experiments represent only 1 year's results from which final conclusions regarding the relative merits of granulated v. pulverized fertilizers should not be drawn, but . . . it is apparent that the new granulated forms of fertilizer gave very promising results and merit additional and more extensive trials."

Acid-base balance in mixed fertilizers, M. F. Morgan. (Conn. [New Haven] Expt. Sta.). (*Amer. Fert., 88 (1938), No. 1, pp. 24, 26*).—The author states the lime requirement per unit of nitrogen of the acid-forming nitrogen sources (ammonium salts, urea, etc.) and the acid-neutralizing power per nitrogen unit of sodium nitrate and of calcium cyanamide. He finds the usual superphosphates and the chloride and sulfate of potassium to have no appreciable effect upon soil reaction but calls attention to the neutralizing effect of potassium carbonate and cotton-hull ash. The balance is often acid, however, and "it is evident that the continued use of fertilizers supplying the bulk of their nitrogen from ammoniacal sources may result in the development of injuriously acid soils."

Development of P_2O_5 insolubility in phosphatic mixtures, W. H. MacIntire, L. J. Hardin, F. D. Oldham, and J. W. Hammond. (Tenn. Expt. Sta.). (*Indus. and Engin. Chem., 29 (1937), No. 7, pp. 758–766*).—The formation of fluorapatite in non-acid-forming ("ammoniated") phosphatic fertilizers is proposed as an explanation for decreases in P_2O_5 availability. "Component fluorides, introduced into phosphatic mixtures by either superphosphates or calcic materials, induced citrate insolubility, whereas that effect was not induced in parallel mixtures devoid of fluorides. When mixed moist with tricalcium phosphate, in 1 to 12 proportion, pulverulent calcium fluoride soon lost its petrographic identity and the mixtures registered characteristic properties of apatite by chemical and Neubauer tests. When acidulated with either H_2SO_4 or H_3PO_4, the behavior of the synthetic fluorapatite corresponded to that of natural apatite, and the liberated calcium fluoride was of submicroscopic dimensions. Different types of dicalcium and tricalcium phosphates reacted with different types of calcium fluoride in variant degree during citrate digestions. It was concluded that the development of citrate insolubility, attributable to fluorapatite formation, will occur not only during the curing of processed superphosphates but also during their analysis."

Fertilizer from rock phosphate: Conversion by fusion and treatment with water vapor, H. A. Curtis, R. L. Copson, E. H. Brown, and G. R. Pole (*Indus. and Engin. Chem., 29 (1937), No. 7, pp. 766–770, figs. 4*).—Because of practical difficulties encountered in attempting to defluorinate rock phosphate by treatment with water vapor at temperatures below the fusion range of the rock, the possibility of defluorinating fused rock phosphate was investigated by the T. V. A. at Wilson Dam, Ala. Small-scale experiments indicated that fluorine could be removed from rock phosphate at temperatures from 50° to 170° C. above its melting point, that contact with water vapor was necessary for rapid defluorination, and that combustion gases from hydrocarbon fuels might be used to supply the water vapor. Products containing approximately 0.1 percent fluorine, 30 percent total P_2O_5, and 26 percent citrate-soluble P_2O_5 were obtained.

Field test of phosphates (*Pennsylvania Sta. Bul. 360 (1938), p. 29*).—The work here very briefly outlined was begun in 1916, utilizes 164 0.1-acre plats, and 12 years' work has been reported upon (E. S. R., 74, p. 14).

Boron deficiency in Michigan soils, R. L. Cook. (Mich. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 2 (1937), pp. 375–382, figs. 9; abs. in Michigan Sta. Quart. Bul., 21 (1938), No. 1, pp. 66, 67*).—In field plat and greenhouse work characteristic boron deficiency symptoms were established for sugar beets, alfalfa, red clover, alsike clover, and sweetclover. Field control of the deficiency disease of beets was not obtained by broadcast applications of 80 lb. of borax per acre, but such applications did no injury to the beets. In the greenhouse, increased yields of alfalfa and alsike clover resulted from applications of small quantities of sodium tetraborate. Crop symptoms are described.

It is concluded that a considerable aggregate of Michigan soils is deficient in boron for sugar beets and the leguminous crops, but the economic seriousness of the deficiency can only be determined by further soil tests and field research.

AGRICULTURAL BOTANY

Native woody plants of the United States, their erosion-control and wildlife values, W. R. Van Dersal (*U. S. Dept. Agr., Misc. Pub. 303 (1938), pp. II+362, pls. 47*).—This monograph considers the relation of vegetation to soil conservation, evaluation of plants for erosion control and wildlife, planting for soil and wildlife conservation, plants of objectionable characteristics, selection of species for planting, development of the plant-growth region map, plant-growth regions, and nitrogen-fixing bacteria, and presents an alphabetically arranged list of plant species, each accompanied by all available data pertinent to its use in erosion control and wildlife conservation (pp. 35–292). A bibliography of 649 references, and an alphabetical list of common names of native woody plants conclude the work. It is pointed out that this indexed list is not intended for use in identification of plants, although the characters given therein may assist in making determinations. "After identification is certain, this publication may be consulted for data on the use of any given woody plant."

A flora of Winneshiek and Allamakee Counties and Clayton County in the vicinity of McGregor, W. L. Tolstead. (Iowa State Col.). (*Iowa State Col. Jour. Sci., 12 (1938), No. 3, pp. 321–384, pls. 2*).—This is an annotated list for northeastern Iowa, with brief preliminary discussion. A bibliography of 27 entries is appended.

Cytogenetic and taxonomic investigations in the Crepidinae, E B. Babcock. (Calif. Expt. Sta.). (*Carnegie Inst. Wash. Yearbook, 36 (1936–37), pp. 308, 309*).—This is a progress report, including cytological and taxonomic studies of the genera *Youngia*, *Lactuca*, *Prenanthes*, and *Crepis*, including also hybridization work between species of the latter.

Mycological notes for 1934–35, L. O. Overholts. (Pa. State Col.). (*Mycologia, 30 (1938), No. 3, pp. 269–279, fig. 1*).—Continuing the series (E. S. R., 74, p. 647), 24 Fungi Imperfecti, 1 Ascomycete, and 6 Basidiomycetes are included (1 new species and 3 new combinations).

Note on estimating bacterial populations by the dilution method, R. D. Gordon. (Univ. Calif.). (*Natl. Acad. Sci. Proc., 24 (1938), No. 5, pp. 212–215*).—The author presents formulas for use with the dilution method.

Distribution of bacteria in certain lakes of northern Wisconsin, W. H. Stark and E. McCoy. (Univ. Wis. et al.). (*Zentbl. Bakt. [etc.], 2. Abt., 98 (1938), No. 10–15, pp. 201–209, fig. 1*).—In open water, at stations of maximum depth for each lake, the bacterial population was very small. In shallow bay areas it far exceeded that of the open water of the same lake and levels. The organic content of the water appeared to be the most important factor in this difference.

Decomposition of nitrogenous substances in sea water by bacteria, S. A. Waksman, M. Hotchkiss, C. L. Carey, and Y. Hardman. (N. J. Expt. Stas. et al.). (*Jour. Bact., 35 (1938), No. 5, pp. 477–486*).—The studies reported examine in some detail the relationship between bacterial multiplication, oxygen consumption, and nitrogen liberation in the decomposition of nitrogenous material (copepods used) in sea water.

Physical characteristics of cells of Azotobacter, Rhizobium, and Saccharomyces, H. Lineweaver. (U. S. D. A.). (*Jour. Bact., 35 (1938), No. 5, pp. 501–509, figs. 2*).—The relations between dry weight, cell volume, and count per cubic centimeter were determined for three species of *Azotobacter*, for *R. meliloti*, and for bakers' yeast. The densities and water contents of the various cells are determined.

Serological relations among spore-forming anaerobic bacteria, E. McCoy and L. S. McClung. (Univs. Wis. and Calif.). (*Bact. Rev., 2 (1938), No. 1, pp. 47–97*).—This is a general, critical review, with bibliography of 381 titles.

The effects of sublethal doses of monochromatic ultraviolet radiation on the growth properties of bacteria, A. Hollaender and B. M. Duggar. (Univ. Wis.). (*Jour. Bact., 36 (1938), No. 1, pp. 17–37, figs. 7*).—Methods and procedures were developed for irradiation and the recognition of the sublethal effects. An apparent initial increase in number of colony-forming organisms and an extension of the lag phase were induced. The influence of a number of factors on the appearance of the phenomena was followed.

Growth rates of phytopathogenic bacteria, E. M. Hildebrand. (Cornell Univ.). (*Jour. Bact., 35 (1938), No. 5, pp. 487–492*).—Generation times of 71–94 min. (average 82 min.) were found for seven strains of *Erwinia amylovora* (=*Bacillus amylovorus*) grown in nutrient broth, this species being definitely more slow growing than *E. carotovora* (=*B. carotovorus*). Similar studies of 11 species of *Phytomonas* gave generation times of 55–155 min. The outstanding result appears to be that the phytopathogenic species of the two main groups studied are unusually slow-growing bacteria.

Light as a factor in the production of pigment by certain bacteria, J. A. Baker. (Cornell Univ.). (*Jour. Bact., 35 (1938), No. 6, pp. 625–631*).—The two cultures of acid-fast bacteria used developed pigment when cultivated in the presence of light but not in darkness, and evidently as a true vital process.

The chemistry of bacteria, W. H. Peterson and M. J. Johnson. (Univ. Wis.). (In *Annual Review of Biochemistry, VII,* edited by J. M. Luck and C. R. Noller. *Stanford University, Calif.: Stanford Univ. Press, 1938, vol. 7, pp. 491–512*).—A review, including nutrient requirements, synthetic constituents of the culture, carbohydrate fermentations, bacterial enzymes, and nitrogen metabolism, with 145 literature references.

Nutrition of the propionic acid bacteria, H. G. Wood, A. A. Andersen, and C. H. Werkman. (Iowa Expt. Sta.). (*Jour. Bact., 36 (1938), No. 2, pp. 201–214*).—The nutritional requirements of the group are shown to be variable, probably depending on the ability of the culture to synthesize essential substances at the time tested. Detailed results are given.

Vitamin B_1 in bacterial metabolism, M. Silverman and C. H. Werkman. (Iowa State Col.). (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 5, pp. 823–827, figs. 2*).—Addition of vitamin B_1 to media in which it was deficient had a distinct stimulating effect on the dissimilation of pyruvate by *Propionibacterium* spp. but not on members of the *Escherichia-Aerobacter* group tested. Since members of the latter group grow well in synthetic media it is believed they are capable of synthesizing this vitamin as rapidly as required, so the need for it can not be demonstrated. On the other hand, propionic-acid bacteria are difficult to culture in such media, one possible reason being their inability to synthesize this vitamin, and hence its need can be readily indicated. The possibility of a bacteriological method for the assay of vitamin B_1 is suggested.

Influence of pH on the dissimilation of glucose by Aerobacter indologenes, M. Mickelson and C. H. Werkman. (Iowa State Col.). (*Jour. Bact., 36 (1938), No. 1, pp. 67–76, fig. 1*).—A critical level in the region of pH 6.3 was shown to exist. It is suggested that the reaction of the medium expresses itself by determining the relative hydrogen accepting ability of acetic acid and CO_2.

Respiratory enzyme systems in symbiotic nitrogen fixation.—I, The "resting cell" technique as a method for study of bacterial metabolism, P. W. Wilson. (Univ. Wis.). (*Jour. Bact., 35 (1938), No. 6, pp. 601–623, figs. 8*).—Using a method of preparing suspensions of resting cells described, the influence of storage of the cells, dilution of the suspension, addition of the specific stimulatory factor ("coenzyme R"), concentration of buffer salts, pH, temperature, and concentration of substrate on the respiration of *Rhizobium trifolii* was determined. From this investigation a suitable technic for studying the respiratory characteristics of the organism was developed, and the relative activities of various carbohydrates, polyhydric alcohols, and organic acids as hydrogen donators when activated by *R. trifolii* with oxygen or methylene blue as acceptors were compared. A bibliography of about two pages is included.

Studies on the nutrition of fungi.—I, Thiamin, its constituents, and the source of nitrogen, L. H. Leonian and V. G. Lilly. (W. Va. Expt. Sta.). (*Phytopathology, 28 (1938), No. 8, pp. 531–548*).—On a synthetic medium 25 fungi failed to grow. With a minute amount of crystalline thiamin added 10 of them grew very well, and with a mixture of amino acids substituted for NH_4NO_3 4 others made good growth. Twenty-four amino acids were used singly or in combinations to replace the NH_4NO_3 of the medium. Amino acids proved to be the controlling growth factors for a few organisms, but many others remained unaffected. Of the two thiamin intermediates tested, 4-methyl-5-β-hydroxyethyl thiazole was inactive alone, while 2-methyl-5-ethoxymethyl-6-

amino-pyrimidine induced growth in 9 organisms. The two constituents together induced growth in 11 organisms, while 3 responded only to thiamin. Five pyrimidines and four thiazoles were tested, confirming the theory that the amino group in position 6 is necessary for pyrimidine activity and that there must be a hydrogen in position 2 and a β-hydroxyethyl group in position 5 for thiazole activity. Solutions of thiamin, pyrimidine, and pyrimidine plus thiazole were adjusted to pH 10, autoclaved for 5 hr. at 15 lb., adjusted to pH 5.5, added to the nutrients, and tested. Autoclaved thiamin induced growth in 10 organisms as against 14 for unautoclaved thiamin. Some organisms failing to grow in the presence of autoclaved thiamin grew on addition of the autoclaved pyrimidine-thiazole mixture.

A method is described whereby yeast extract was fractionated to yield two compounds. The first induced growth in the organisms responding to the thiazole-pyrimidine mixture, while the other fraction proved active for the organisms failing to respond to thiamin or its intermediates.

The bibliography contains 34 references.

A comparative study of certain fungi cultivated on carbohydrate media, A. E. Edgecombe (*Ill. State Acad. Sci. Trans., 30 (1937), No. 2, pp. 108–110*).—Representatives of six fungus genera were cultured in three basic media, each containing glucose, sucrose, starch, or galactose, and the growth rates and mycelial production were noted. The results apparently indicated that the supposedly toxic galactose does not exert in agar media the same definitely deleterious effect on the fungus mycelium that it does on the roots of green plants, though there was some slight retardation in rate of growth and slight reductions in colony size and hyphal diameter and an increase in abnormal structures was noted. Suggestions as to the causes of the difference in behavior from green plants are made.

The dual phenomenon in imperfect fungi, H. N. Hansen. (Univ. Calif.). (*Mycologia, 30 (1938), No. 4, pp. 442–455, figs. 4*).—Reference is made to the increasing number of papers on variability in the phytopathogenic Fungi Imperfecti. The author presents evidence that much of this variability is not due to mutations in pure culture but rather to the fact that many fungi as they exist in nature, though operating as definite entities, are composed of two distinct elements or individuals ("dual phenomenon"). Of some 900 isolates of 30 genera analyzed by single-spore methods, more than 50 percent proved to be dual. Such fungi, when single spored, give rise to three culture types, viz, one producing abundant mycelium and few conidia, a second with abundant conidia and relatively less mycelium, and a third type in general intermediate between the first two, suggesting that it is composed of the other two types. Evidence is presented as showing the dual phenomenon to be due to heterocaryogenesis. The frequency of duality in the group suggests that it may be the natural condition for many of them.

Mycorrhizae from the Uinta Basin, L. K. Henry (*Ann. Carnegie Mus., 25 (1935–38), pp. 63–72, pls. 2*).—Ectotrophic mycorhizas were found on 8 of the 15 different plant rootlets collected in this Utah area. Five of these hosts were growing above the Aspen zone where the soil is neutral or slightly acid, while the other three were in the Sub-montane Shrub zone but with soil conditions not those of a typical alkaline desert. All but one of the nonmycorhizal species were in the desert shrub and desert woodlands with distinctly alkaline soil. The findings are taken to indicate that the ectotrophic mycorhizas can develop and flourish in sand and sand-humus mixtures as long as the soil remains neutral or acid, but are unable to do so under the alkaline conditions of the desert. *Betula fontinalis*, *Pinus brachyptera*, *P. edulis*, and *Populus aurea* are new as mycorhizal hosts.

The influence of mycorrhizae on the growth of shortleaf pine seedlings, F. J. Miller. (U. S. D. A.). (*Jour. Forestry, 36 (1938), No. 5, pp. 526, 527*).—In a Forest Service nursery it was observed that after a satisfactory germination stand the shortleaf pine seedlings growing in soil not in pines the previous year remained dormant during the late spring and summer, while those growing in soil in pines the previous season maintained a consistent rate of growth throughout the entire season. The author suspected these differences to be related to the absence and presence, respectively, of mycorhizas. A careful study of three test plats appeared to confirm this theory. It is believed that the experiments indicate a desirable planting succession to be a soiling crop the first year, pine transplants the second year, 1-0 shortleaf pine the third year, etc. While the data here presented are not considered conclusive, it is believed that their presentation will aid in solving some of the problems found in pine nurseries established on old farm land.

The cytology and histology of the root nodules of some Leguminosae, F. W. Bieberdorf. (Iowa State Col.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 5, pp. 375–389, figs. 27*).—The legume-nodule bacteria were found to enter the host by an infection strand, usually through the root hairs, causing characteristic curvatures. They may also enter through ordinary epidermal cells. Not all the entering bacteria form nodules. Large numbers of the bacteria may retard the growth of the young seedling, as they appear to be parasitic during the early stages of nodule development, interfering with the normal functioning of the root hairs. The endodermis was not penetrated in the legumes studied, the nodules arising only in the critical parenchyma and not in the pericycle. The bacteroidal tissues in the soybean and cowpea nodules increased by division of the infected cells. The infection strand was broken up by cell division, and lost its identity. The bacteroidal tissue in alfalfa, sweetclover, and vetch was mainly increased by infection of new tissue which is constantly laid down by a meristem, the infection strand here remaining unbroken in the bacteroidal cells. Variation in cell-division rate in the meristem resulted in a branched nodule. The older bacteroidal cells in soybean and cowpea nodules lost their ability to divide, and the nucleus disintegrated. Vacuoles which enlarged and crowded the bacteria and remaining contents against the inner cell were common in this tissue. Vascular bundles were formed in the nodules, surrounding the bacteroidal cells and connecting with the root xylem and phloem. The vascular system developed from the cortical parenchyma by forming procambial strands, and was composed of xylem surrounded by phloem. New xylem was continuously added to the vascular bundles in soybean and cowpea, in which these bundles united at the apex, unlike those in alfalfa, sweetclover, and vetch. In the soybean nodule a layer of sclerenchyma cells surrounding the bacteroidal and vascular tissues developed, limiting the nodule growth. This layer, developed from cortical parenchyma, was not found in the cowpea, alfalfa, sweetclover, and vetch nodules. Starch grains were abundant in unaffected cells of the bacteroidal tissue and around the vascular bundles. Apparently parasitic filamentous fungi were found in the nodules. These hyphae resembled the bacterial infection strands, and may have been mistaken as such by earlier investigators.

Humidity variations affecting transpiration, H. F. Thut (*Ill. State Acad. Sci. Trans., 30 (1937), No. 2, pp. 153, 154, fig. 1*).—Using coleus varieties, cotton, hibiscus, and lantana, humidity was controlled by different concentrations of H_2SO_4 in the method described.

Influence of residue color of bordeaux mixture on transpiration in sun and shade, J. D. Wilson and H. A. Runnels (*Ohio Sta. Bimo. Bul. 193 (1938), pp. 129–138, fig. 1*).—Bordeaux mixture affects the leaf temperature, particularly in sunshine. Since this alters the vapor pressure gradient between leaf and air, the transpiration rate is also affected. Although the ultimate effect of bordeaux mixture is to increase the rate of water loss, transpiration may actually be decreased in sunlight if the residue reflects sufficient radiant energy so that the leaf is cooled below the air temperature. Addition of lampblack to the fungicide increased the temperature above that of the air, but excess lime had the reverse effect. The leaves of all plants tested were warmer than the air when in full sunlight. Those with the 4–12–50 residue were cooler than the controls, while those with the lampblack mixture were warmer. The 4–4–50 residue had little effect on temperature. Lampblack plus bordeaux was more effective in increasing the transpiration rate in full sunlight than in shade. The transpirational responses of coleus, tomato, cucumber, tobacco, bean, and potato to the different sprays all showed similar trends. From all data (9 a. m. to 3 p. m.) with coleus and tomato, plants in the shade lost ±60 percent as much water as those in full sunlight. In the same tests, black atometers in the shade lost 70 percent as much as those in the sun. Sunlight intensities (measured by black and white atometers) were 35 percent as great in shade as in sunlight. Cutting off two-thirds of the radiant energy by a shade reduced the average transpiration rates in the sun by ± 42, 40, 39, and 40 percent for untreated plants and those bearing the 4–4–50, 4–12–50, and blackened residues, respectively. Relative transpiration for the untreated plants was 5.6 in the sun and 4.6 in the shade, indicating that evaporation was reduced less than transpiration by shading.

Relation of condensation reactions to meristematic development, W. E. Loomis. (Iowa State Col.). (*Bot. Gaz., 99 (1938), No. 4, pp. 814–824*).—Using *Populus balsamifera, Melilotus alba,* and corn in this study, a hypothesis is presented to explain the observed facts, as follows:

"The massed meristems are able to utilize simple organic forms of nitrogen and to condense these forms into protoplasm in the formation of new cells. The diffuse meristems are less effective or ineffective in condensing simple nitrogenous forms, and can develop only when supplied with partially condensed forms of protoplasm building compounds, probably with simple albuminoid proteins. The condensed forms required by diffuse meristems may be synthesized in darkness in the presece of auxins, with the phloem indicated as the seat of the reactions; or they may be formed in lighted leaves, possibly independently of known growth substances."

Influence of photoperiods upon the differentiation of meristems and the blossoming of Biloxi soy beans, H. A. Borthwick and M. W. Parker. (U. S. D. A.). (*Bot. Gaz., 99 (1938), No. 4, pp. 825–839, figs. 8*).—Stimulation of two short photoperiods sufficed to alter the developmental course of the growing points in such a way that differentiation of flower primordia resulted. The length of the photoperiod influenced the time of blooming, since the plants receiving intermediate photoperiods bloomed earlier than those receiving the extremely long or short photoperiods used. The number of days under the various treatments influenced the time of blooming, plants treated for 8 days blooming earlier than those treated for 6 days. Meristems of plants on the long day are described and compared with those on the short day. The first visible response to short photoperiod occurred in the axil of the fourth leaf primordium from the tip of the main stem, and in a similar position in certain axillary buds. The region of quickest morphological response at the time treatment is applied is an undifferentiated meristem. An after-effect of photoperiodic treatment is expressed in the total number of compound leaves produced on the main stem. Treatments of less than 8 days failed to suppress the addition of compound leaves.

A study of phototropism in the sunflower, M. W. O'Connor (*Ohio State Univ., Abs. Doctors' Diss., No. 25 (1937), pp. 305–310, fig. 1*).—This is an abstract of a doctorate dissertation dealing with the effects of different wavelengths and intensities of light, the respective roles of the leaves and growing tips, the possible role of auxins, and the effects of different soil water constituents.

"Root-pressure:" An unappreciated force in sap movement, P. R. White (*Amer. Jour. Bot., 25 1938), No. 3, pp. 223–227, figs. 6*).—Excised tomato roots growing in vitro secreted sap continuously and rhythmically from their proximal ends. Methods of measuring the force of this secretion were developed and are described. This force was not retarded by opposed pressures of 90 lb. per square inch and it therefore probably greatly exceeds this value. Since the 90-lb. pressure suffices to raise water 200 ft., and since the existence of such secretion pressures has been demonstrated in normally metabolizing. actively growing roots, it is concluded that root-pressure may be far more important for sap movement than has been generally conceded.

Root-pressure as a factor in the rise of sap, P. R. White (*Nature [London], 141 (1938), No. 3570, pp. 581–583, fig. 1*).—The essential content of this paper is noted above.

Penetration of radioactive ions, their accumulation by protoplasm of living cells (Nitella coronata), S. C. Brooks. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 5, pp. 856–858*).—The author reports experiments with radioactive isotopes of K, Na, Rb, and Br, revealing the steps in the process of penetration of these ions into living cells. It was found indispensable to separate the protoplasm from the sap, and to study each of these portions by itself.

Effects of heat and cold treatment upon enzyme activity in bulbs and corms, H. J. Fuller and J. H Hanley. (Univ. Ill.). (*Ill. State Acad. Sci. Trans., 30 (1937), No. 2, pp. 113, 114*).—The activity of catalase, oxidase, and peroxidase was definitely accelerated in hyacinth, gladiolus, and Ornithogalum bulbs subjected to 5° C., while at 40° a slight acceleration in gladiolus and a definite decrease in activity of these enzymes in the others was apparent. Diastase, invertase, and peptase activity differed but little in the various sets. It is concluded that the oxidizing enzymes are especially affected by the heat treatment.

The use of heteroauxin in rooting of subtropicals, J. B. Biale and F. F. Halma. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 443–447, figs. 5*).—The minimum effect of concentration for rooting citrus leaves and mature or immature cuttings of citrus and other subtropicals was a basal application of 0.01 percent of heteroauxin, but the range of effective concentrations varied considerably not only among the species but also among the three types of cuttings from the same species. The chief effect was manifested by an increase in number of roots, but this effect was most evident in species which root readily. The time of year when the cuttings are taken and the tree condition are thought to be important factors which must be accounted for in evaluating the heteroauxin effect on cuttings.

Bud development in Lilium harrisii following treatment with indoleacetic acid, J. M. Beal (*Natl. Acad. Sci. Proc., 23 (1937), No. 6, pp. 304–306, figs. 2*).—Axillary bulbils developed near the treated cut stem surface in this species, while only adventitious roots developed in *L. philippinense formosanum* near the treated surface.

Histological responses of three species of Lilium to indoleacetic acid, J. M. Beal (*Bot. Gaz., 99 (1938), No. 4, pp. 881–911, figs. 16*).—In these further studies the author confirmed the same two types of reaction to indoleacetic acid, viz, the production of adventitious buds in the axils of the upper two to three leaves of *L. harrisii* and of adventitious roots in *L. philippinense formosanum*, and in addition found *L. longiflorum* to respond like the latter. Detailed histological and cytological data are presented and illustrated. Cytological study of mitotic figures in both the induced roots and buds indicated regular chromosome form and behavior in division.

Colletotrichum circinans as a semiquantitative test unit for the growth substance produced by Rhizopus suinus, C. L. Worley and B. M. Duggar. (Univ. Wis.). (*Science, 88 (1938), No. 2275, p. 132*).—Use of *C. circinans* as described is said to have definite advantages over the *Aspergillus niger* method. The change in yield is greater per increment of growth substance added, replicates show lesser variations, temperature fluctuations over a few degrees are of little significance, and successive daily changes in growth rate for a given culture can be recorded and studied.

Growth of excised roots of the tomato, W. J. Robbins and M. B. Schmidt. (Univ. Mo. et al.). (*Bot. Gaz., 99 (1938), No. 4, pp. 671–728, figs. 20*).—Undertaken to define the nutritional requirements of the root of a higher plant, this study confirmed the possibility of unlimited growth of excised tomato roots in White's solution composed of mineral salts, sugar, and yeast extract, each of the three parts being required. The essential nature of the yeast extract was due to its vitamin B_1 or vitamin thiazole content, and probably for the same reason neopeptone, malt flour, and certain samples of maltose at suitable concentrations could be substituted for it, while various other compounds tested could not. Vitamin B_1 was effective in extremely small amounts, but did not replace inorganic nitrogen or sulfur. Apparently no other source of nitrogen than nitrates was required, while cane sugar, glucose, levulose, maltose, or cellobiose were available carbon sources. White's mineral solution was inadequate for the best growth of tomato roots, but addition of boron and zinc, as well as certain samples of filter paper and filter paper ash, improved it. Pfeffer's solution with 2.5 p.p.m. of $Fe_2(SO_4)_3$ in place of 0.8 p.p.pm. of $FeCl_3$ proved superior to White's mineral solution when yeast extract was replaced by vitamin B_1. Light was not required for unlimited growth.

Regions of growth in hypocotyls, C. E. Brian and E. L. Stover (*Ill. State Acad. Sci. Trans., 30 (1937), No. 2, pp. 105, 106*).—It was observed that hypocotyl growth in lima beans, watermelons, and castor-beans was decreased by daily exposure, handling, and changing of position. The growth region in these hypocotyls was not limited to any one segment, but by far the greatest growth occurred in the part immediately below the cotyledons, the amount of elongation decreasing uniformly from top to base of the hypocotyl.

Synthesis of fats by green plants, G. O. Burr and E. S. Miller. (Univ. Minn.). (*Bot. Gaz., 99 (1938), No. 4, pp. 773–785, figs. 3*).—The authors describe an apparatus permitting aliquot parts of gas streams to be collected from a respiration chamber at desired intervals, and a method for making a seal enclosing an attached leaf or fruit in this chamber without apparent injury to the plant. Under the experimental conditions, using the castor-bean plant *Ricinus communis lividus*, no diffusion of CO_2 or O_2 through the petioles could be detected. The data obtained indicated that a considerable amount of fat is synthesized within the fruit. The possibility of translocation of some fat is discussed, but it is concluded that more detailed analytical data are required for determining whether some type of lipid is slowly moved into castor-bean fruits during periods of low respiration quotients.

Green plants and the reactions of iron, N. A. Clark. (Iowa State Col.). (*Iowa Acad. Sci. Proc., 43 (1936), pp. 185–189*).—This is an analytical review on the problem of iron availability for plants, including a progress report on studies by the author and his associates.

Magnesium as a factor in nitrogen fixation by soybeans, E. R. Graham (*Missouri Sta. Res. Bul. 288 (1938), pp. 30, figs. 12*).—Using colloidal clay as a carrier of Mg, along with Ca, and with Ca and K as the other plant nutrients, nitrogen fixation by soybeans increased with higher Mg levels and higher degrees of saturation of the clay by this nutrient when accompanied by a constant Ca saturation. It did not occur at a low Ca level in the absence of Mg, but occurred if a small amount of Mg was added to the low Ca level. The amount of N fixed was closely correlated with the growth of the plants on colloidal clay cultures containing constant Ca levels and Mg increments, growth increasing with increments of Mg and the N fixation paralleling it. Though increased N fixation was always accompanied by increased growth, the reverse was not always true. Plants on colloidal clay cultures treated with the cations Ca, Mg, and K grew well without fixing N in commensurate amounts. With Ca and Mg the only nutrient elements sorbed by the colloidal clay in exchangeable form, the Mg increments enabled the plant to use more efficiently the Ca offered at a given level. Addition of H and of K to the Ca-Mg colloidal clay cultures reversed the previous results, H decreasing both growth and N-fixing power and K increasing growth but reducing the N-fixing power—possibly through a disturbed carbohydrate : N ratio in the early growth stages of the plants. The ability of soybeans to fix N decreased rapidly with consecutive croppings, the second cropping fixing very little and the third none. This suggests that the exchangeable base supply on the clay may be reduced by one crop to the point where it becomes the limiting factor in the growth of legumes and their N fixation.

Mathematical expression of equilibrium between lime, magnesia, and potash in plants, W. Thomas. (Pa. Expt. Sta.). (*Science, 88 (1938), No. 2279, pp. 222, 223, fig. 1*).—In continuation of his studies of foliar diagnosis (E. S. R., 79, p. 23), the author presents and discusses a graphical expression, plotting in trilinear coordinates a magnitude designated as the CaMgK unit, representing the equilibrium between CaO, MgO, and K_2O at the moment of sampling, derived by converting the percentage composition for CaO, MgO, and K_2O of the third leaf into milligram equivalent values, and determining the proportion each of these bears to the milligram equivalent total.

Organisms requiring vitamin B_1, W. J. Robbins. (Univ. Mo.). (*Natl. Acad. Sci. Proc., 24 (1938), No. 2, pp. 53–56*).—Certain species of *Phytophthora* (*P. cinnamomi* and *P. capsici*) were found apparently to require vitamin B_1 and to be unable to utilize its thiazole or pyrimidine intermediates satisfactorily. The different groups of organisms in their relation to this vitamin and its intermediates are summarized, and a biological method of detecting their presence is suggested, the success of which would depend on the use of suitable organisms and further evidence of the specificity of vitamin B_1 and its intermediates for the organisms.

Foliar diagnosis: Application of the concepts of quantity and quality in determining response to fertilizers, W. Thomas. (Pa. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 269–272, fig. 1*).—The technic and illustrations of the principles involved are presented. In measuring the response to fertilizers by analyses of leaves of the same physiological age periodically during growth, the two magnitudes representing quantity and quality of nutrition are inseparably connected in the physiological processes of the leaf and must, consequently, be considered simultaneously. The quantity of nutrition consists of the sum ($N+P_2O_5+K_2O$) of the elements at the moment of sampling expressed as a percentage of the dried material, while the quality of nutrition is the ratio of these "elements" (entities) to each other at the moment of sampling.

The efficiency of monocotyledon roots in soil conservation, H. J. Dittmer (*Iowa Univ. Studies Nat. Hist., 17 (1938), No. 8, pp. 343–346*).—The author reviews previous work, including his own (E. S. R., 78, p. 609), and presents further data on the roots and root hairs of oats, winter rye, and Kentucky bluegrass under field conditions. It was indicated that oats would be least efficient of the three, since its secondary roots are farther apart and fewer in number. Winter rye is said to be, in general, superior to other cereals and *Poa pratensis* to the other grasses in retarding erosion.

The fermentation of cigar-leaf tobacco, J. J. Reid, D. W. McKinstry, and D. E. Haley. (Pa. Expt. Sta.). (*Science, 86 (1937), No. 2235, p. 404*).—This preliminary report emphasizes the significance of micro-organisms in the normal fermentation of cigar-leaf tobacco. Two species of spore-forming bacilli and several mold genera were found, and of the latter *Aspergillus* and *Penicillium* predominated. The catalase activity of the tobacco was directly correlated with the numbers of bacteria present, and such activity was restored to heat-treated tobacco by inoculation with cultures previously isolated from tobacco.

An apparatus for the extraction of internal atmospheres from fruits and vegetables, C. Brooks. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 202, 203, fig. 1*).—This apparatus is fundamentally similar to that described by Culpepper, Moon, and Lutz (E. S. R., 77, p. 596).

A new method for the quantitative measurement of gases, E. M. R. Lamkey (*Ill. State Acad. Sci. Trans., 30 (1937), No. 2, pp. 127, 128*).—The apparatus and method described in this note were designed especially for demonstration and study of the reversible respiratory-photosynthetic equation.

Methods of measuring radiation for biological purposes, including a new densitometer method, L. DeVore, H. W. Popp, W. R. Ham, and D. C. Duncan (*Pennsylvania Sta. Bul. 359 (1938), pp. [2]+40, figs. 6*).—The authors discuss the radiometer, bolometer, alternating-current bolometer, thermopile, selective methods and instruments, and photographic method for measuring the energy distribution in the visible and ultraviolet, concluding that the choice of an instrument or method of measuring radiation in any biological problem will depend on the nature of the source to be used, the variability of the radiation to be studied, and many other factors. Obviously no one instrument or method applies equally well to all conditions, but it is believed that the photographic method here described should have wider use, especially among botanists. By this method, from a spectrogram of the source it is possible to determine the total energy of the source as well as the distribution of this energy in the near infrared, visible, and ultraviolet regions of the spectrum. Appendixes have to do with the derivation of the interpolation formula for use in calculating intensities from photographic records of unknown and standard sources, and the precision of the photographic method and analysis of sources of error.

The effects of KCN upon the penetration of certain oxidation-reduction dyes into living cells, M. M. Brooks. (Univ. Calif.). (*Jour. Cell. and Compar. Physiol., 11 (1938), No. 2, pp. 253–258*).—Potassium cyanide in the concentrations used had no effect on the penetration rate of methylene blue into *Valonia* sap, but at certain concentrations it retarded the penetration of 2,6-dibromophenol-indophenol and of neutral red. Methylene blue and neutral red penetrated into the sap in the oxidized form, and the indophenol dye in the reduced form. The aerobic reduction potential of the cell was not affected by KCN in the external solution.

A procedure for growing, staining, and making permanent slides of pollen tubes, E. H. Newcomer. (Pa. State Col.). (*Stain Technol., 13 (1938), No. 3, pp. 89–91, fig. 1*).—Agar (0.5 g) and an optimum amount of sugar are boiled in 25 cc of tap water or Hoagland's solution, and after cooling to ±35° C., 0.5 g of powdered gelatin is added with stirring until melted. This is smeared thinly on the slide and the pollen dusted on, and germinated in a moist chamber. The recommended staining procedure (L. F. Randolph's crystal violet) is outlined.

A quantitative method of determining the lethal effect of ultraviolet light on bacteria suspended in air, D. G. Sharp (*Jour. Bact., 35 (1938), No. 6, pp. 589–599, figs. 4*).—Broth cultures are atomized into the air, the bacteria-air mixture is passed through a tube where it is exposed to ultraviolet light, and the air is then passed through nutrient broth, which can be plated out and the count made or merely incubated and examined for growth. Measurements are made of the lamp current and air velocity.

GENETICS

Physiological genetics, R. Goldschmidt (*New York and London: McGraw-Hill Book Co., 1938, pp. IX+375, figs. 54*).—This book deals especially with the physiology of the gene and gene action.

Heredity, A. F. Shull (*New York and London: McGraw-Hill Book Co., 1938, 3. ed. pp. XVII+442, [pl. 1], figs. 168*).—Another edition of the book previously noted (E. S. R., 65, p. 724) sets forth the principles of plant and animal, as well as human, genetics.

Inheritance of growth curve, K. Ebiko (*Jour. Amer. Soc. Agron., 30 (1938), No. 7, pp. 558–563, fig. 1*).—Analyses of the growth curves of parents and F_1–F_3 progeny of a cross between the early ripening Italian Spring wheat and the late Sapporo Harukomugi No. 10 led to the conclusion that the constant K may be inherited according to Mendelian rule.

A cytological analysis of polyploidy induced by colchicine and by extremes of temperature, H. Dermen. (U. S. D. A.). (*Jour. Heredity, 29 (1938), No. 6, pp. 211–229, pl. 1, figs. 6*).—The methods and results of inducing polyploidy in the meiotic and somatic cells of a spiderwort (*Rhoeo discolor*) with colchicine and temperature changes are described, and some suggestions are presented for plant breeders interested in experimentally induced polyploidy.

The genetics of incompatibilities in homomorphic flowering plants, A. B. Stout (*Bot. Rev., 4 (1938), No. 6, pp. 275–369, figs. 21*).—This comprehensive, critical review (with over four pages of bibliography) discusses the main classes of incompatibilities; special conditions and problems; the theory of oppositional factors and the personate type of incompatibility; incompatibility, compatibility, and fertility in *Nicotiana;* incompatibilities in red clover, *Antirrhinum*, and *Petunia*; the *Capsella* type of incompatibilities; the associate type of incompatibility; polyploidy and incompatibilities; and selection for self-compatibility.

Heterothallism and variability in Venturia inaequalis, G. W. Keitt and D. H. Palmiter. (Univ. Wis.). (*Amer. Jour. Bot., 25 (1938), No. 5, pp. 338–345, figs. 5*).—In this study the eight spores of an ascus were isolated and the in vitro cultures from each were used individually and in all possible pairings to infect apple leaves, which, with controls, were overwintered and examined for perithecia. Ascospore-bearing perithecia were found in all cases where any of a group of four isolates was mated with any of the other four (but in no other cases except sparsely on three leaves where contamination was suspected). In a modified repetition, ascospores were produced only from expectedly fertile pairings. Paired in vitro, ascospore-bearing perithecia were produced from 4 of the 16 expectedly fertile pairings, but not in similar cultures with expectedly nonfertile pairings. Fameuse, Hubbardston Nonsuch, and Missouri Pippin leaves were infected by each of the eight isolates. In inoculation tests on Yellow Transparent and McIntosh apples, the leaves were typically infected by four isolates, but not by the other four. From these and other data presented it is concluded that *V. inaequalis* is heterothallic in the sense that the isolates studied fall into two groupings with reference to sterility, being hermaphroditic, self-sterile, intragroup sterile, and intergroup fertile. Combinations are, therefore, a major source of heritable variations in this pathogen.

Chromosome numbers in nodules and roots of red clover, common vetch, and garden pea, L. Wipf and D. C. Cooper. (Wis. Expt. Sta.). (*Natl. Acad. Sci. Proc., 24 (1938), No. 2, pp. 87–91, figs. 6*).—Observations thus far indicated that in nodules of red clover ($2n=14$), common vetch ($2n=12$), and garden pea ($2n=14$) the infected cells are regularly tetraploid, i. e., 28, 24, and 28, respectively.

Inheritance in a cross between Avena sativa and Avena sterilis ludoviciana, G. K. Middleton. (N. C. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 3, pp. 193–208, fig. 1*).—Studies on the inheritance of certain kernel characters and linkage relations in *A. sativa* Aurora (cultivated) × *A. sterilis ludoviciana* (a wild form) are reported. The wild type of basal articulation was recessive to the cultivated form, and appeared to be linked closely with genes for heavy basal pubescence, red color of kernel, and two strong awns. Genes for yellow and black kernel color segregated independently of that for red, and the gene for black was linked completely with a gene producing dorsal or lemma pubescence. There appeared to be an inhibitor associated with the *A. sativa* base which affects basal pubescence and strength of awn. Certain families produced a few *fatua*-like plants which apparently originated through some chromosome aberration.

A "one-leaved" white clover, S. S. Atwood. (U. S. D. A.). (*Jour. Heredity, 29 (1938), No. 6, pp. 238–240, fig. 1*).—A unifoliolate mutation occurred among a group of *Trifolium repens* plants grown from open-pollinated seeds and apparently was not due to chromosomal change.

The relation between single and double cross yields in corn, D. C. Anderson. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 3, pp. 209–211*).—Actual yields of 15 double crosses of corn agreed closely with the predicted yields as obtained by averaging the yield of the 4 single crosses not used as parents. "If top crosses are used to pick out inbred lines for testing in double cross combinations, it is apparent from these results that it is highly desirable to study all possible single crosses between each of 4 lines in order to determine how they should be combined."

Translocations in maize involving chromosome 9, E. G. Anderson (*Genetics, 23 (1938), No. 3, pp. 307–313*).—Linkage relations with waxy for 14 translocations involving the long arm of chromosome 9 in corn are reported on. The amount of crossing over with waxy is closely correlated with the cytological position of the interchange.

Cytology of twin cotton plants, J. M. Webber. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 2, pp. 155–160, figs. 2*).—The cytology of the polyembryonic (twin) cotton plants studied appeared to support the suggestion that polyembryony is an expression of genic disharmony between two unlike sets of chromosomes. The diploid twins of *Gossypium hirsutum* and haploid-diploid twins of *G. barbadense* probably developed from twin eggs, while conjoined diploid twins of *G. nanking* × *G. thurberi* F_2 probably involved sporophytic budding. The mean chromosome conjugation of haploid *G. barbadense* was 25.6$_{\text{I}}$ (univalents)+0 2$_{\text{II}}$ (bivalent); of its diploid twin, 0.12$_{\text{I}}$+25.66$_{\text{II}}$+0.14$_{\text{IV}}$ (quadrivalent); and of its selfed offspring, 0.16$_{\text{I}}$+25.64$_{\text{II}}$+0.14$_{\text{IV}}$. The limited pairing of chromosomes within the haploid strongly supports Skovsted's conclusion (E. S. R., 71, p. 457) that cultivated American cottons are allopolyploids.

A "lazy" mutation in rice, J. W. Jones and C. R. Adair. (U. S. D. A. and Ark. Expt. Sta.). (*Jour. Heredity, 29 (1938), No. 8, pp. 314–318, figs. 3*).—The lazy or prostrate habit of growth of the rice selection (2914A2–1) described appeared to be due to a recessive factor mutation which probably occurred in an F_2 plant of Caloro × Blue Rose. Genetic studies of progeny from segregating F_3 families from the same F_2 plant and F_2 and F_3 populations from lazy selection × Blue Rose indicate that the lazy growth habit is a simple recessive to normal. The lazy plants appeared to be largely ageotropic and the normal plants negatively geotropic. Lazy plants were not deficient in dry matter when either 50 days old or when fully-headed plants 102 days old.

Genetic relations of some color factors in lettuce, R. C. Thompson (*U. S. Dept. Agr., Tech. Bul. 620 (1938), pp. 38, pls. 4, figs. 2*).—The presence of anthocyanin in the leaves of lettuce (*Lactuca sativa*) was found to be due to two pairs of complementary allels designated as *Cc* and *Tt*. The intensity and pattern of the pigment in three pigmented-types studies were controlled by a multiple allelic series of three genes, *Rr'r*. A linkage between *Cc* and *Rr'r* to the extent of 36 percent of recombinations was indicated by the F_2 and F_3 segregations. Black seed (*WW*) behaved as a single factor dominant to white seed (*ww*). A chlorophyll deficiency in the leaves of lettuce proved to be non-Mendelian in its inheritance. The deficiency in chlorophyll is inherited only through the deficient portions of the mother plant.

The relation between satellite size and nucleolus size in three races of Solanum lycopersicum, M. M. Lesley (*Genetics, 23 (1938), No. 5, pp. 485–493, figs 6*).—The difference between three races of tomatoes differing in size of the *A* or nucleolar chromosome was found due to the addition of satellite material which apparently carries no genes. Nucleolar size in races with two long *A* chromosomes averaged about 50 percent larger than races with two short *A* chromosomes. There was a similar difference in size between long *A* and very long *A* races. No relation was observed between chromosome size and external plant characters, fruitfulness, or pollen abortion.

Vegetative anatomy of the tomato (Lycopersicum esculentum Mill.).—III, Diploid and haploid plants, E. F. Woodcock. (Mich. State Col.). (*Mich Acad. Sci., Arts, and Letters, Papers, 23 (1937), pp. 243–245, pl. 1, fig. 1*).—In continuation of these studies (E. S. R., 79, p. 25), the haploid plant was found to show no marked internal anatomical difference from the diploid plants from which it arose. The most noticeable external differences were the dwarfed habit of the haploid plant, and the smaller number of leaf-blade hairs.

Size inheritance and geometric growth processes in the tomato fruit, J. W. MacArthur and L. Butler (*Genetics, 23 (1938), No. 3, pp. 253–268, figs. 2*).—In support of the view that inheritance of fruit size in the tomato involves fundamentally geometric processes, the authors advance the following evidence: (1) The average F_1, F_2, and backcross fruit sizes approach more closely to the geometric than to the arithmetic mean of the parents crossed; (2) linked-size genes, as well as fruit-shape and other genes affecting size, appear to operate on a percentage basis; (3) the F_2 distributions were positively skew; and (4) histological examination of the developing fruits showed that the basic phenomena involved are those controlling cell number and cell size, both of which apparently acted during limited time-effective periods and in a geometric manner.

Tomato inheritance, with special reference to skin and flesh color in the orange variety, H. K. Fleming and C. E. Myers. (Pa. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 609–624*).—Studies of the F_1, F_2, and backcross generations from crosses of Golden Dwarf Champion, with colorless skin and yellow flesh; Connecticut Orange, with standard growth, yellow skin, and orange flesh; and Burpee Self-Pruning, with determinate growth, colorless skin, and red flesh, suggested that inheritance of skin and flesh color in the tomato is probably more complex than hitherto supposed. Growth habit, on the other hand, was clear cut, with standard habit completely dominant over dwarf and determinate. A three-factor hypothesis for inheritance in skin color and a multiple-factor hypothesis for flesh color are presented.

Somatic mutations in fruits [trans. title], M. Schmidt (*Züchter, 9 (1937), No. 4, pp. 81–91, figs. 9*).—Herein is presented a general summary of the situation as revealed by American and European studies.

Pollination studies with the Yuksa sandcherry hybrid, W. L. Kerr (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 73–75, fig. 1*).—Yuksa, a sandcherry × apricot hybrid, planted in 1925 bloomed freely for many years without setting fruit despite proximity to other species. However, when emasculated and crossed with various hardy apricots and Mayflower peach, fruits were secured. Yuksa is conceded to be of little economic value but may assist in the breeding of hardy northern peaches and apricots.

Inheritance of the so-called everbearing tendency in the strawberry, J. H. Clark. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 67–70*).—Observations on 61 crosses in which at least one of the parents was an everbearer showed, in most cases, that the everbearing tendency behaves as a dominant character affected by some type of factor interaction. No varieties homozygous for the everbearing character were found. The variation in the genetic behavior of different everbearing varieties and the complex polyploid nature of the species indicated the need of extensive breeding experiments to reach a solution of the problem. The everbearer, New Jersey No. 1, produced no everbearing seedlings when selfed or crossed with noneverbearers. The New Jersey No. 8 variety gave a much lower percentage of everbearers, when selfed or crossed with noneverbearers, than did other everbearers. One variety, New Jersey No. 220, carried the everbearing character as a recessive.

Picta patterning in phlox, J. P. Kelly. (Pa. Expt. Sta.). (*Jour. Heredity, 29 (1938), No. 4, pp. 149–151, figs. 2*).—This is a brief account of the inheritance of a color pattern in *Phlox drummondi*.

Inheritance studies of a dwarf mutant in verbena, S. L. Emsweller and C. O. Blodgett. (Univ. Calif. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 822–824*).—Crosses between Fireball, a dwarf compact variety of indicated homozygosity, and certain commercial kinds yielded all trailing forms in the F_1. Observations on the F_2 and backcrosses to the Fireball parent indicated that the dwarf bush habit is a monogenic recessive to trailing habit.

[Papers on animal genetics and breeding] (*Jour. Dairy Sci., 21 (1938), No. 5, pp. 117–121, 122, 126–132, 139, 140, 167, 168*).—Brief abstracts are given of the following papers presented at the 1938 meeting of the American Dairy Science Association: Initiation of Lactation in the Albino Rat, by R. P. Reece (pp. 117, 118); Recent Advances in Our Knowledge on the Endocrine Control of Mammary Development, by E. T. Gomez and C. W. Turner (pp. 118, 119); The Biological Assay of "Mammogen," by A. A. Lewis and C. W. Turner (pp. 119, 120); Milk and Fat Production of Dairy Cows as Influenced by Thyroxine and Anterior Pituitary Extracts, by N. P. Ralston and H. A. Herman (pp. 120, 121); Fat Metabolism of the Mammary Gland, by J. C. Shaw and W. E. Petersen (p. 122); A Report of the Occurrence of Four Cases of Agnathia, by F. Ely, H. B. Morrison, and F. E. Hull (pp. 126, 127); Maximum Initial Yield and Persistency as Inherited Characters Influencing Total Lactation Yield, by L. O. Gilmore, W. E. Petersen, and J. B. Fitch (p. 127); Herd Averages Computed by the Cow-Year Method Versus Herd Averages Based Only on Cows on Test at Least 10 Months, by J. L. Lush and F. Johnston (pp. 127, 128); Age and Its Influence on Culling and Life Expectancy in Dairy Cows, by D. M. Seath and J. L. Lush (pp. 128, 129); The Breeding Efficiency of Proved (Aged) Sires, by J. R. Dawson (pp. 129, 130); Twelve Years With 1,200 Cows, by J. D. Bragg (p. 130); Artificial Insemination of Dairy Cattle, by C. L. Cole (pp. 131, 132); What We Can Learn From Denmark in the Use of Artificial Insemination, by E. J. Perry (pp. 139, 140); and The Extraction and Assay of the Hormones of Cattle and Sheep Pituitaries, by A. J. Bergman and C. W. Turner (pp. 167, 168).

Indirect evidence for the mating system in natural populations, J. B. S. Haldane (*Jour. Genet., 36 (1938), No. 2, pp. 213–220*).—Methods of statistical analysis are presented for tests of randomness of matings where there is no dominance and where dominance exists.

New contribution to the study of heterochromosomes in mammals and especially in rodents [trans. title], R. Matthey (*Jour. Genet., 36 (1938), No. 1, pp. 73–102, pls. 5, figs. 6*).—Descriptions are given of the reduction division with special emphasis on the behavior of the *X* and *Y* chromosomes based on studies of testicular material of various species of rats and field mice: *Epimys norvegicus* Erxl., *Arvicola scherman* Shaw, *Apodemus sylvaticus* L., and *A. agrarius* Pallas. Differences in the attachments and separation involving crossing-over between the sex chromosomes in the different species are discussed.

Pedigree promise and progeny test among sires proved in Iowa Cow Testing Associations, J. L. Lush and E. N. Shultz. (Iowa Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 8, pp. 421–432*).—A study of the production of the ancestors, progeny, and mates of 303 Holstein-Friesian bulls proved in Iowa Cow Testing Associations before 1936 showed that bulls with Advanced Registry testing in their pedigrees had higher-producing daughters than bulls without such testing, but the dams were higher producing and therefore the increases induced in the production of the daughters over the dams averaged less than for sires from non-Advanced-Registry-tested ancestors. Only a small fraction of the superiority of the ancestors of a bull could be transmitted to his progeny, but it is deemed desirable to consider ancestors' performance in the selection of a herd sire.

Mating systems in wild populations of Dermestes vulpinus and Mus musculus, U. Philip (*Jour. Genet., 36 (1938), No. 2, pp. 197–211, figs. 3*).—From a well-defined population of *D. vulpinus* it was found that matings were at random, whereas in mice from a population in a Scottish coal mine little heterozygosis was found.

Some biochemical data on the grey-lethal mouse, E. Watchorn (*Jour. Genet., 36 (1938), No. 1, pp. 171–176*).—Analyses of blood sugar and glycogen in the tissues of gray-lethal mice showed low liver glycogen levels and low blood phosphorus values. Muscle glycogen was normal, with a tendency to low blood sugar values.

Studies of multiple allelomorphic series in the house-mouse, III, IV (*Jour. Genet., 36 (1938), No. 1, pp. 139–143, fig. 1; pp. 145–152*).—Two papers are presented in continuation of this series (E. S. R., 77, p. 318).

III. *A spectrophotometric study of mouse melanin*, J. Daniel.—A spectrophotometric study of melanin from the hair of mice of known genotypes showed only insignificant differences in the absorption spectra. Evidently changes in coat color are due to quantitative rather than qualitative differences in the pigment. Reference is made to possibilities of scattering rather than true absorption.

IV. *Quantitative comparisons of melanins from members of the albino series*, L. C. Dunn and W. Einsele.—Comparison was made of quantities, color intensities, and size of melanin granules in the wild type and three mutants in the *c* locus in the combination with black and brown. The reduction in hair color by graded steps from full color to white is accompanied by a gradual reduction in the quantity of melanin and reduced size of granules. Each mutant in the albino series exerts a characteristic effect on granule size, but the type of melanin molecule was assumed to be the same.

Ivory, a feral mutation in Peromyscus, R. R. Huestis (*Jour. Heredity*, *29* (*1938*), *No. 6*, *pp. 235–237*, *fig. 1*).—Ivory, a character expressed by a young male *Peromyscus* trapped at Eugene, Oreg., was found to be genetically recessive but not allelomorphic to albinism, pink eye, silver, agouti, and brown. Young ivory mice were pale brown, but successive coats were lighter. Ivory mice had red eyes.

A diagrammatic method of presenting the history of reproduction in a dairy herd, S. W. Mead. (Univ. Calif.). (*Jour. Dairy Sci.*, *21* (*1938*), *No. 6*, *pp. 283–287*, *figs. 3*).—A diagrammatic method of showing the reproductive history in dairy herds is presented, with examples for two herds over 6 yr.

Satisfactory procedure developed for the artificial insemination of dairy cattle, D. R. Theophilus (*Idaho Sta. Bul. 225* (*1938*), *p. 40*).—A satisfactory procedure for artificial insemination of dairy cattle by the introduction of 0.5 cc of undiluted semen collected with the Cambridge rubber sperm collector, directly into the cervix, resulted in 62.5 percent pregnancies.

The reproductive cycle of the coyote, G. W. D. Hamlett (*U. S. Dept. Agr.*, *Tech. Bul. 616* (*1938*), *pp. 12*, *pls. 2*, *figs. 2*).—From a study of more than 800 reproductive tracts of coyotes it is concluded that females have a definitely limited breeding season, with males retaining fertility slightly longer. Since only one set of corpora lutea was found in any of the ovaries, it seems probable that the animal is not polyoestrous. The onset of the breeding season varied under different climatic conditions.

The reproductive cycle of the golden hamster (Cricetus auratus), R. Deanesly (*Zool. Soc. London Proc.*, *1938*, *Ser. A*, *I*, *pp. 31–37*, *pls. 4*).—The reproductive cycle of the golden hamster, which has a gestation period of 16 days and rears up to 12 young per litter, is described. Cyclic changes in the vaginal epithelium were especially marked.

Bird flocks and the breeding cycle, F. F. Darling (*Cambridge, Eng.: Univ. Press*, *1938*, *pp. X+124*, *pl. 1*, *fig. 1*).—Courtship and seasonal breeding cycles in wild birds are described.

The breeding seasons of Southern Hemisphere birds in the Northern Hemisphere, J. R. Baker and R. M. Ranson (*Zool. Soc. London Proc.*, *1938*, *Ser. A*, *I*, *pp. 101–141*).—Marked differences were noted in the breeding response of different Southern Hemisphere birds in Northern Hemisphere conditions. Some changed their breeding season to agree with the corresponding season; others continued breeding in the same calendar months; and some bred all the year around, even though they had distinct limited breeding seasons in the Southern Hemisphere.

London starlings and seasonal reproduction in birds, W. Rowan (*Zool. Soc. London Proc.*, *1938*, *Ser. A*, *I*, *pp. 51–77*).—Preseasonal development of the gonads of London starlings as contrasted with the winter development of the gonads of country starlings in England is attributed to the greater period of wakefulness imposed by the city disturbances.

Sex dimorphism in the plumage of the domestic fowl, A. W. GREENWOOD and J. S. S. BLYTH (*Jour. Genet., 36 (1938), No. 1, pp. 53–72*).—A critical review of the more important theoretical interpretations of sex dimorphism in the plumage of the adult fowl is presented. Special consideration is given to the role of the gonads, thyroids, adrenals, and pituitaries.

'Ovoid bodies' from the oviducts of rabbits, E. V. ENZMANN (*Anat. Rec., 71 (1938), No. 2, pp. 125–131, pl. 1*).—The formation of ovoid bodies in the oviducts of rabbits from cellular debris acquiring a coating of albumin is noted. In mice, atretic follicles seem to furnish the foundation for such bodies.

Gonadotropic potency of the hypophysis in a wild male rodent with annual rut, L. J. WELLS. (Univ. Mo.). (*Endocrinology, 22 (1938), No. 5, pp. 588–594*).—Continuing studies of the endocrine relations to reproduction in the ground squirrel (E. S. R., 76, p. 613), variations in the gonadotropic potency of pituitaries from male squirrels were found in assays on female mice to parallel seasonal cytological variations in the hypophysis. Castration or low temperatures were found to prevent seasonal reductions in gonadotropic potency.

The development in vitro of the mammalian gonad: Ovary and ovogenesis, P. N. MARTINOVITCH (*Roy. Soc. [London] Proc., Ser. B, 125 (1938), No. 839, pp. 232–249, pls. 3*).—Studies of the ovaries from young rats and mice showed that the entire process of oogenesis could proceed normally in vitro for about 4 weeks. Differentiation of germ cells occurred in all of the cultures. Growth of the follicles was frequently suppressed. The embryonic rat ovary doubled its volume after 4 weeks' cultivation.

Aberrant ovarian follicles in the immature rat, C. E. LANE (*Anat. Rec., 71 (1938), No. 2, pp. 243–247, pl. 1*).—Of 28,522 follicles counted in 100 rat ovaries removed from animals from 15 to 64 days of age, there were 5 containing binuclear ova, 13 were biovular, and 3 were triovular. The atypical follicles seemed more susceptible to atretic degeneration than normal follicles.

The effect of male hormone substances upon birth and prenatal development in the rat, J. B. HAMILTON and J. M. WOLFE (*Anat. Rec., 70 (1938), No. 4, pp. 433–440*).—Daily injections of testosterone propionate administered to pregnant females delayed parturition when the injections were started late in gestation. Treatment early in gestation hindered fetal development. There was a masculine appearance in the young from the androgen-treated mothers. At birth females exhibited a penislike clitoris and scrotumlike perineum, and in some cases lack of development of female reproductive organs. At maturity, the female reproductive system was functional, but the outer portion of the vagina and nipples were underdeveloped.

Experimental intersexuality: The production of feminized male rats by antenatal treatment with estrogens, R. R. GREENE, M. W. BURRILL, and A. C. IVY (*Science, 88 (1938), No. 2275, pp. 130, 131*).—The male progeny of 32 pregnant female rats injected with oestradiol dipropionate during the latter part of gestation showed varying degrees of feminization or intersexuality at birth, involving the presence of nipples, testes at the base of the kidneys, and inhibition of the prostatic diverticula.

Molecular structure in relation to oestrogenic activity: Compounds without a phenanthrene nucleus, E. C. DODDS and W. LAWSON (*Roy. Soc. [London] Proc., Ser. B, 125 (1938), No. 839, pp. 222–232*).—Study of the oestrogenic activity on rats of various compounds showed that the phenanthrene ring system was not necessary, for substances containing two phenol groups joined by a carbon chain were acitve. Substitutes in the aromatic nucleus apart from the hydroxyl group lessened activity.

FIELD CROPS

[Field crops experiments at the Georgia Coastal Plain Station, 1936]. (Partly coop. Ga. Expt. Sta. and U. S. D. A.). (*Georgia Coastal Plain Sta. Bul. 28 [1937], pp. 10, 11, 15–39, 73–75, 108–115, figs. 4*).—Work with field crops reviewed as heretofore (E. S. R., 77, p. 38) for 1936 and for different periods of years included variety tests with cotton, corn for yield and resistance to weevils, oats, wheat, rye, grain sorghum, sorgo, sweetpotatoes, tobacco, peanuts, perilla, lespedeza, soybeans for seed and forage, cowpeas, velvetbeans, crotalaria, pasture grasses, and miscellaneous summer forage crops; breeding work with corn, cotton, oats, peanuts, soybeans, and pasture grasses; fertilizer experiments with corn, oats, clover, peanuts, and velvetbeans; winter cover crops for cotton and corn; germination tests with woolly fingergrass; and cultural (including planting) experiments with oats, wheat, and peanuts. Fertilizer experiments with cotton, tobacco, and sweetpotatoes were concerned with formulas, carriers of nitrogen, phosphorus, and potassium, and also with fertilizer placement for cotton and tobacco; nitrogen and potassium top dressings for cotton and sweetpotatoes; boron tests and fractional applications with tobacco; and ratios of organic: nonorganic nitrogen with sweetpotatoes. Recommendations on soils, varieties, plant beds, fertilizers, spacing, and curing for flue-cured tobacco are also included.

[Field crops work in Idaho, 1937], K. H. W. Klages, W. V. Halversen, L. Verner, H. L. Spence, J. Toevs, R. J. Johnson, W. A. Moss, and R. Knight. (Partly coop. U. S. D. A.). (*Idaho Sta. Bul. 225 (1938), pp. 20–26, 37, 38, 53, 64–66, 67, 68–70, 72, 75–78, 80–83, figs. 3*).—Experiments with field crops (E. S. R., 77, p. 770) reported on briefly from the station and substations included breeding work with winter and spring wheat, corn, barley, oats, field peas, alfalfa, Ladino clover, sweetclover, and crested wheatgrass; intergeneric crosses of grasses; variety tests with oats, winter and spring wheat and barley, alfalfa, field peas, potatoes, corn and sweet corn strains, and miscellaneous forage grasses and legumes; need for inoculation of alfalfa; the effect of using nurse crops with clover and alfalfa; cultural (including planting) trials with grasses and clovers for hay and seed; fertilizer tests with alfalfa, red clover for seed, crested wheatgrass, barley, and potatoes; manured and ordinary crop rotations; use of straw mulch for potatoes; and weed control, particularly bindweed. The activities of the State seed laboratory are again reviewed.

[Field crops research in North Carolina, 1936 and 1937], C. B. Williams, W. H. Rankin, S. C. Clapp, J. W. Hendricks, E. R. Collins, E. H. Hostetler, J. J. Skinner. G. A. Cummings, R. J. Harris, H. B. Mann, P. H. Kime, J. H. Moore, D. B. Anderson, E. G. Moss, J. L. Rea, Jr., G. K. Middleton, S. G. Lehman, R. L. Lovvorn, M. E. Gardner, R. Schmidt, R. E. Currin, Jr., C. Dearing, J. F. Bullock, J. P. Young, R. H. Tilley, T. Kerr, R. W. Cummings, O. P. Owens. W. H. Chapman, and R. F. Poole. (Partly coop. U. S. D. A.). (*North Carolina Sta. Rpts. 1936, pp. 18, 19, 20–27, 31, 32, 35–38, 40, 41, 66, 67; 1937, pp. 26–28. 29, 30, 31–34, 37–39, 40–44, 45, 46, 48–50, 55, 60–62*).—Experimentation with field crops (E.S.R., 79, p. 42) reported on from the station and substations included variety tests with cotton, corn, barley, wheat, oats, soybeans, peanuts, crotalaria, tobacco. and potatoes; a study of cowpeas resistant to wilt caused by *Fusarium vasinfectum tracheiphilum* and root knot caused by *Heterodera marioni;* breeding work with cotton, tobacco, corn, wheat, oats, barley, peanuts, potatoes, and soybeans; inheritance and heterosis studies with cotton; environmental factors affecting the establishing of permanent pastures in the Coastal Plain area of the State; effects of certain dusts and sprays on growth, yield, and quality of peanuts; a study of factors influencing the yield and quality of peanuts; tobacco fertilizer investigations concerned with fractional applications, nitrogen and potash sources, needs of tobacco for sulfur, lime, chlorine, magnesium, and minor elements; tobacco in rotation with oats, soybeans, and rye, and tobacco after soybeans, and plant bed fertilizer studies; tobacco curing experiments and a curing test with the coal stoker; effect of preceding legumes on tobacco; fertilizer experiments with cotton, involving phosphorus carriers, organic:inorganic nitrogen ratios, concentrated fertilizers and methods of applying them, and placement studies; cotton fiber research dealing with effects of source and care of seed, influence of potash deficiency "rust" upon yield and quality, physical properties of lint of improved varieties, the influence of illumination upon the structure of the cotton fiber cell wall, origin and early stages of elongation in the cotton fiber, chemical composition of the lint hair wall during the period of elongation, physical structure of the wall of cotton fibers, growth ring and boll temperature studies, and relation of fiber properties to spinning quality; fertilizer needs of corn and soybeans in rotation and the form and rate of lime for corn on muck soil; fertilizer mixtures for potatoes and sweetpotatoes; yields and quality of different field crops when grown in variously fertilized and limed rotations on several soil types; effects of crops on succeeding crops; effect of rotation upon succeeding crops when normal amounts of fertilizer are used; crotalaria-corn rotations; and the utilization of crops grown in rotation with cotton by two different methods.

[Crop production research in Pennsylvania] (*Pennsylvania Sta. Bul. 366 (1938), pp. 31–33, 35, 36, figs. 2*).—Brief comments are made on progress results of breeding work with wheat, oats, grasses, and clovers; variety tests with wheat and oats; maintenance of fine turf by fertilization and management practices; potato rotations; and potato farming with the tractor.

Investigations in plot technic with small grains, H. H. Love and W. T. Craig. (Coop. U. S. D. A.). (*[New York] Cornell Sta. Mem. 214 (1938), pp. 26*).—Analysis of data from two oats crops, made for various types of plats and numbers of replications and for rows 15 and 30 ft. in length, revealed that single rows with enough replications are very satisfactory, but 3-row blocks with several replications, when all 3 rows are harvested, give more accurate results. For single rows or 3-row blocks, 8 or 10 replications are better than a smaller number, as 3 or 5. However, the smaller number is useful in the earlier eliminations of new strains. The efficiency coefficients for the 10-row and the advanced test, 3-row blocks replicated 10 times, were found to be high, showing further that these methods are satisfactory. When the amount of land is considered, 15-ft. rows appear more desirable than 30-ft. rows.

Indications were that for rod-row tests, check plats need not be closer than every tenth row. As to methods of interpreting results based on check plats, the average of all checks, the grading method, and a combination of the two gave about the same results with few exceptions. It was shown that the use of check plats does not introduce an error, and that when actual yields are compared with calculated check yields by using gain or loss values no important errors arise. The gain or loss value was shown to be more reliable for varietal comparison over a period of years than is yield alone.

Studies based on different yield trials at Ithaca showed that the effect of competition is not serious enough to affect the relative yields of the varieties, an observation supported by data obtained at other stations. This held true in such comparisons as with results from the nursery where wheat varieties differing greatly in ability to withstand severe winters were studied.

Comparison of yields (without regard to experimental error) from a number of varieties grown in a systematic and in a random series showed that, in general, the relative yields are about the same.

Winter wheat and sorghum production in the southern Great Plains under limited rainfall, O. R. Mathews and L. A. Brown (*U. S. Dept. Agr. Circ. 477 (1938), pp. 60, fig. 1*).—A study was made of yields of winter wheat and sorghums that might have been obtained through the entire period for which precipitation records are available over part of the southern Great Plains, including certain counties in southwestern Kansas, in the Oklahoma and Texas Panhandles, and in southeastern Colorado. Formulas representing the relationship established between rainfall, soil moisture, and crop yields for experiment stations within or near the area were tested at other stations and were applied to the whole area for estimating yields in sections where only precipitation records were available.

The use of water was shown to be related closely to wheat yield. A decrease of 1 in. in annual precipitation, it was found, meant fewer good crops, more failures, and, more important, a material increase in the number of times consecutive years of failure might be expected. Precipitation alone was a good basis for estimating sorghum yields. Complete failures were much less frequent than with wheat, but with decreasing average precipitation there was an increasing number of years when sorghum would have made only forage. Yields were higher and failures much less frequent on sandy loam soils than on soils with finer texture. The merits of summer fallow and of livestock production, as respective ways to minimize wheat failures and their effects, are discussed.

Fourth International Grassland Congress, Great Britain, July 8–23, Report (*Aberystwyth: Cambrian News, Ltd., 1937, pp. XXXIV+486, [pls. 5], figs. [39]*).—This report of the proceedings of the Fourth International Grassland Congress (E. S. R., 75, p. 288) includes, among papers delivered at Aberystwyth on July 15–17, 1937, articles (with German abstracts) entitled Plant Breeding in Relation to Pasture Improvement, by P. V. Cardon (pp. 31–38), Pasture Improvement in Relation to Erosion Control in the United States, by C. R. Enlow (pp. 97–105), Restoring Range Lands in the United States, by W. R. Chapline (pp. 124–128), and Natural Revegetation of Abandoned Farm Land in the Central and Southern Great Plains, by D. A. Savage and H. E. Runyon (pp. 178–182) (all U. S. D. A.); Growth Behaviour and Relative Composition of Pasture Grasses as Affected by Agricultural Practices, by W. A. Leukel (pp. 183–186) (Fla. Expt. Sta.); The Influence of Wild White Clover on the Seasonal Production and Chemical Composition of Pasture Herbage, and Upon Soil Temperature, Soil Moisture, and Erosion Control, by D. B. Johnstone-Wallace (pp. 188–196) ([N. Y.] Cornell); The Effects of Fertilizers on the Soil, the Botanical and Chemical Composition of the Herbage, and the Seasonal and Total Production of Grassland in Connecticut, by B. A. Brown (pp. 313–317) ([Conn.] Storrs); Response of *Poa pratensis* L. to Different Harvest Treatments, Measured by Weight and Composition of Forage and Roots, by H. D. Hughes (pp. 447–452) (Iowa); and Seven Years' Results of Monthly Clipping of Pastures, by R. H. Lush (pp. 453–456) (La.).

The silicon content of grasses, A. R. Patton. (Ark. Expt. Sta.). (*Amer. Nat., 72 (1938), No. 741, pp. 387, 388*).—The silicon contents of 42 species of grasses ranged from 0.5 percent in sacaton (*Sporobolus wrightii*) to 4.9 percent in smooth brome (*Bromus inermis*) and Indian grass (*Sorghastrum nutans*).

The effect of natural selection in a mixture of barley varieties, H. V. Harlan and M. L. Martini. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *57* (*1938*), *No. 3, pp. 189–199, figs. 6*).—A mixture of 11 barley varieties was grown at 10 experiment stations from New York to California for from 4 to 12 yr. Annual population counts showed that poor varieties were eliminated rapidly, and that the dominant variety was quickly evident. The best variety at some stations was eliminated completely at others, and few varieties survived at all places. When plotted as curves the dominant variety ascended in almost a straight line, some of the intermediate varieties first increased and then decreased, and the poorer barleys decreased rapidly at first and the last plants were eliminated slowly. The trends in general agreed with a series of theoretical curves based upon assumed differences in rate of increase or decrease among the varieties.

The origin of cultivated cotton, R. R. Gates (*Empire Cotton Growing Rev.*, *15* (*1938*), *No. 3, pp. 195–200*).—Some of the advances made toward a solution of the problem of the origin of the cultivated American cottons, based on recent cytological and genetical work, are pointed out.

Improvements in the technique of cottton hybridization, L. M. Humphrey and A. V. Tuller. (Coop. U. S. D. A.). (*Arkansas Sta. Bul. 359* (*1938*), *pp. 11, figs. 4*).—The improved method of making cotton hybrids described as satisfactory both in the field and greenhouse involves the use of soda straws inserted over the stigma of the emasculated flower and wired to the plant instead of clipped or tied to the bracts. Stamens of the male parent are put into the straw so that pollination will be accomplished when they open, and the flower need not be visited again.

Outlying cotton variety experiments, 1936 and 1937, L. M. Humphrey (*Arkansas Sta. Bul. 360* (*1938*), *pp. 48, fig. 1*).—Variety tests at 13 locations in the Arkansas Cotton Belt included 16 widely grown commercial strains and, in the Hempstead County test, also 8 Texas varieties. The test results suggested that not more than 8 varieties would be needed to plant all the principal types of land in the Arkansas cotton districts. On the basis of individual performance at different locations, varieties best adapted for the delta and river bottom land are D. & P. L. 11A and Delfos 719 medium to short staple varieties, Stoneville 5 where land is not too poorly drained, and Coker Wilds 7 if long staple is desired; on second bottoms and fertile uplands, Stoneville 5, Roldo Rowden 40–2–9, Arkansas Rowden 5056 and 4046, Delfos 719, and Arkansas Acala 1114 and 4067; in regions approaching lowland conditions, D. & P. L. 11A; and in hilly regions and on thin upland soil, Stoneville 5 and the three Rowden strains. Qualla, Kasch, Lankart, Mars Rose, and Half & Half were considered as not adapted to Arkansas conditions. Data are included on yield, lint length and percentage, earliness, boll size, and acre values.

The classification of cotton (*U. S. Dept. Agr., Misc. Pub. 310* (*1938*), *pp. 54, figs. 20*).—This handbook deals in order with the nature of cotton and basis of its classification; sampling and the care and handling of samples; factors of, standards for, and the determination of grade; method of grading irregular and special-condition cotton: inaccuracies in grading cotton; factors of staple and the standards for staple; method of stapling and common errors in stapling; factors of character; effect of moisture on staple and character; and the relation of classification to prices. Official notices establishing cotton standards for grade and length of staple are appended.

Flax production in Idaho, K. H. W. Klages (*Idaho Sta. Bul. 224* (*1938*), *pp. 12, fig. 1*).—Information is given on the adaptation of seed flax to Idaho conditions; varieties; its soil, cultural, and irrigation requirements; place in the crop rotation; harvesting and threshing practices; and marketing the seed. While flax seems in a relatively good position to compete with spring-sown cereals on the basis of per-acre value of crop, a greater price differential than currently exists is considered necessary to place flax in a favorable competitive position with winter wheat.

Practices suggested from experiments and experience include the use of the Bison variety, sown early at the rate of 3 pk. per acre not deeper than 1 in. on clean, rather heavy soil with a firm seedbed receptive to moisture and rather frequent light irrigations, especially during the blooming and early filling stages, the crop to be thoroughly ripe when cut with a binder, and completely dry when threshed.

Flax production in Kansas, F. E Davidson and H. H. Laude (*Kansas Sta. Circ. 191* (*1938*), *pp. 14, figs. 3*).—A revision of Circular 173 (E. S. R., 71, p. 39), with similar conclusions.

Flax as a coming crop, W. H. Friend. (Tex. Expt. Sta.). (*Tex. Farming and Citric., 15* (*1938*), *No. 1, p. 6, fig. 1*).—Practical suggestions for growing seed flax under irrigation in the lower Rio Grande Valley.

Culture and pests of field peas, R. McKee and H. A. Schoth (*U. S. Dept. Agr., Farmers' Bul. 1803* (*1938*), *pp. II+16, figs. 8*).—The adaptations of field peas (*Pisum arvense*); varieties; soil, fertility, and cultural requirements; handling the crop as green manure or for pasture; harvesting for hay and seed; threshing; and other practices are discussed in a practical manner, and information is given on diseases and insect enemies. This publication supersedes Farmers' Bulletin 690 (E. S. R., 34, p. 140).

Effect of date of harvest on yield and milling quality of rice, W. D. Smith, J. J. Deffes, C. H. Bennett, C. R. Adair, and H. M. Beachell (*U. S. Dept. Agr. Circ. 484* (*1938*), *pp. 20, figs. 9*).—Farm field studies and plat experiments (E. S. R., 78, p. 778), here reported in some detail, indicated that for maximum acre yields of high milling quality rice should be harvested when the moisture content of the standing crop ranges from about 23 to 28 percent. The rice of varieties studied normally reaches this moisture content in from 16 to 20 days after the panicles start to turn down, or from 30 to 35 days after heading begins. The kernels then are fully mature in the upper portions of the panicles and are in the hard-dough stage at the panicle base. As the moisture in the standing rice decreased a marked increase occurred in the air-dried weight of kernels, in yield per acre, in percentage of whole kernels obtained in the milling quality test, and in germination. Harvesting operations begun when rice has reached the proper stage of maturity for cutting, as indicated by its moisture content, should proceed rapidly so that all of the crop will be cut before becoming too ripe. On warm dry days the moisture loss from the standing rice is rapid but may be retarded greatly on days of high humidity.

Wound healing in potatoes (Triumph variety) as influenced by type of injury, nature of initial exposure, and storage conditions, H. O. Werner (*Nebraska Sta. Res. Bul. 102* (*1938*), *pp. 40, figs. 6*).—In further studies (E. S. R., 77, p. 621) Triumph tubers subjected to tangential and radial cuts and feathering, i. e., removal of periderm, were exposed to sunshine for varying periods and were held under different storage conditions. Sections were cut from samples taken at intervals from 5 to 265 days after injury to determine rates and extent of the wound-healing phases.

With tangential cuts in tubers held in humid-cellar storage, typical of that available in western Nebraska and adjacent States, the suberization of parenchyma beneath the cut surface occurred between the third and fifteenth day, phellogen activity appeared between the twentieth and fortieth days, and phellem cells (suberized wound-cork periderm) appeared first on the fifteenth day with differentiation of this region practically completed by the fortieth day. The healing of radial cuts into tubers differed from tangential cuts by later and less extensive suberization, an earlier and more persistent phellogen, and earlier formation of a phellem. Inner portions of a radial cut healed much more slowly than the portion close to the old periderm. Suberization under feathered wounds began earlier but was slower and less extensive than under radial cuts. Periderm formation seemed to start later and was less extensive. With all types of wounds, a wound periderm was never observed to have developed across cells immediately under the old periderm (probably outer cortical cells). As the exposure of tangential wounds was more severe there was an increase in thickness of the false cicatrice (consisting of layers of dead cells) and apparently an earlier and more prolonged and extensive suberization of parenchyma. Phellogen activity was delayed and was less extensive, resulting in later formation of a thinner phellem.

The exposure of radial cuts to sunshine resulted in less damage and less retardation of wound healing than with tangential cuts. As the exposure increased in severity the cracks became wider, the false cicatrice became wider and extended further into the deeper portions of the cuts, suberization of parenchyma occurred earlier and was more prolonged and more extensive, but the wound periderm which developed later was less extensive. Feathered tubers after exposure to sunshine healed in about the same manner as did wounds of tangential cuts. Exposure to sunshine did not materially alter the effects of various storage conditions upon the wound-healing process. Wounds of tangentially cut tubers and also radially cut and feathered tubers became suberized and developed a wound periderm much faster in a warm humid room than in a humid cellar. In dry-cellar storage the process was still slower, and in cold storage suberization was greatly delayed and a phellogen never developed.

Treating freshly wounded tubers with hot formaldehyde caused much damage to unprotected tissues and a consequent increase in mold and rot in storage.

Maturity of potato seedlings in the greenhouse and their later behavior in the field, F. A. Krantz. (Minn. Expt. Sta.). (*Amer. Potato Jour., 15 (1938), No. 6, pp. 153–157*).—Significant differences in mean number of days to maturity were obtained between families of seedling potatoes in the greenhouse. Progenies from crosses involving early varieties matured more quickly than those from late varieties. The coefficient of correlation for maturity between greenhouse and field was 0.56. Indications were that early and late families reacted the same for maturity in the greenhouse and the field. Maturity in the greenhouse, when combined with field observations, may increase the reliability of the estimate of the breeding value of a parent for quick maturity.

Seed stock improvement for the early potato crop, R. A. Jehle and E. A. Walker. (Md. Expt. Sta.). (*Peninsula Hort. Soc. [Del.] Trans., 51 (1937), pp. 140–149, fig. 1*).—Results from the use of spring-grown seed for planting the late potato crop (E. S. R., 79, p. 189) and from storage temperature studies with Irish Cobbler seed potatoes (E. S. R., 79, p. 189) are reviewed, with a report on later work. Tests in 1937 indicated that Eastern Shore home-grown Irish Cobbler seed potatoes exposed to relatively high temperatures for a short period just before planting outyield seed of the same source held longer at lower temperatures and have about the same amount of virus diseases.

Effect of preceding crops on yields of Green Mountain potatoes, G. F. Lea and T. E. Odland. (R. I. Expt. Sta.). (*Amer. Potato Jour., 15 (1938), No. 6, pp. 164–170, fig, 1*),—Preceding crops of rutabagas, millet, alsike clover, and red clover consistently resulted in decreased yields of Green Mountain potatoes in 1930, 1933, and 1936, whereas higher yields of potatoes followed onions, oats, winter rye, redtop, and squash. Results with the clovers were substantiated by data from rotations. These effects were evident when certain crops were grown 1 yr. on potato land and might extend into a second year.

Summer legumes for the commercial potato crop in south Alabama, L. M. Ware. (Ala. Expt. Sta.). (*Amer. Potato Jour., 15 (1938), No. 7, pp. 183–188*).—Experiments, 1932–37, at the Gulf Coast Substation in the commercial potato section of south Alabama showed that summer legumes turned under before an early crop of potatoes are responsible for only small increases in potato yields for the first 2 or 3 yr. Continued use of a summer legume in a definite soil improvement system results by the fourth year in a material increase in potato yield, apparently due directly to nitrogen added by the legume, and in higher productivity of the soil. There appeared to be a low efficiency in the use of nitrogen supplied by summer legumes.

Influence of farm manure on yields and sucrose of sugar beets, S. H. Hastings, S. B. Nuckols, and L. Harris (*U. S. Dept. Agr., Tech. Bul. 614 (1938), pp. 12*).—The extent to which varying applications of farm manure influenced the yields and the sucrose content of sugar beets (E. S. R., 78, p. 622) at the Scotts Bluff (Nebr.) Field Station is recorded. Results from irrigated rotations, 1912–35, indicated that applications of farm manure may be expected to more than double beet yields and substantially increase yields of other crops included in the rotations listed. Mean percentage increases for all crops 1930–35 ranged from a minimum of 68 for potatoes to a maximum of 134 for sugar beets. A 30-ton initial application of farm manure per acre has maintained beet yields as effectively as did five 6-ton applications. Increasing applications of farm manure up to 30 tons annually resulted in progressively increased yields, but the largest per-ton values of the manure accompanied the lighter treatments. Indications were that excessive applications of farm manure have depressed both sucrose percentages and apparent purity coefficient, which, however, were not reduced by moderate and practical amounts of manure, so effective in stimulating sugar beet yields.

Sugar cane variety report, seasons of 1935–36–37, C. B. Gouaux (*Louisiana Sta. Bul. 297 (1938), pp. 11*).—Results from test fields (E. S. R., 75, p. 774) on Mississippi River first bottom soils indicate that C. P. 28–19, C. P. 29–320, and C. P. 28–11 are the three most important field varieties. Co. 290 and C. P. 29–116 varieties should be grown for commercial cane only on heavy and poorly drained soil types and not on an extensive field basis in this area. In the Teche section Co. 290 led, with C. P. 29–320, C. P. 28–19, C. P. 28–11, and Co. 281 following in order. Co. 290 also was the leading variety on Mississippi River Terrace soils (Lintonia and Olivier), with C. P. 29–320, C. P. 28–11, and C. P. 28–19 following in order. On the Red River soils, C. P. 29–320, C. P. 28–19, C. P. 28–11, and Co. 281 were the best varieties. Although other varieties produce more sugar per acre than Co. 281, the standard windrowing cane, the increase in cane production in Louisiana without proportional increase in milling rate has resulted in a prolonging of the grinding season with greater cold hazard, and risks would be excessive without suitable acreages of Co. 281.

Wheat in Missouri, W. C. Etheridge and C. A. Helm (*Missouri Sta. Bul. 398 (1938), pp. 41, figs. 18*).—Practices in wheat growing, based extensively on station research and discussed in some detail, include the choice of varieties

(Michigan Wonder and Fulcaster are indicated of the seven most used in Missouri); good seed: seedbed preparations after small grain, corn, soybeans, and lespedeza; fertilizers; control of insect pests and diseases; and the merits of the 1-yr. wheat-lespedeza rotation as to high returns, low cost, soil conservation, safety, and management. Comments are also made on the status of the crop, stability of yields 1866–1937, quality, relation of wheat to soil conservation, early wheat obtained by growing the recently distributed Missouri Early Premium winter wheat, and on wheat as a feed and pasturage.

Proceedings of the Association of Official Seed Analysts of North America, 1930–33 (*Assoc. Off. Seed Anal. North Amer. Proc., 23–26 (1930–33), pp. 298, figs. 16*).—The activities of the association and its committees during the years indicated are reviewed. No meeting was held in 1934. Earlier and later reports have been noted (E. S. R., 75, p. 625; 76, p. 787).

Papers presented at the twenty-third annual meeting at Cleveland, Ohio, from December 31, 1930, to January 2, 1931, included Work of the Various Seed Laboratories (pp. 23–30) and Variations in Purity Analyses (pp. 45, 46), both by O. A. Stevens (N. Dak. Expt. Sta.); Affidavit Grimm Alfalfa Seed, by C. P. Bull (pp. 34, 35); Results of Ten Years of Germination Tests on the Same Samples of Vegetable Seeds, by A. L. Stone (pp. 76–80); Variations in Seed Testing, by E. Brown (p. 41), and A Direct Method for Testing *Poa Pratensis*, by A. F. Musil (pp. 60–68) (both U. S. D. A.); Variations of Purity Analyses and of Germination Tests as Influenced by Sampling, by C. W. Leggatt (pp. 42–45) (Ont.); The Basis for Tolerances and Their Limitations in Practice as Applied to Seed Testing, by W. O. Whitcomb (pp. 49–53), and Laboratory and Field Germination of Infected Beans; Effectiveness of Seed Treatments, by W. D. Hay (pp. 80–82) (both Mont.); Changes in Weight and Percentage Composition of Seed Samples, by E. P. Emack (pp. 56–60) (Md.); Report on Project to Determine the Percentage and Duration of Viability of Different Varieties of Soybeans Grown in North Carolina, by J. L. Burgess (p. 69); Germination Characteristics of Wild Oats, by A. M. Lute (pp. 70–73), and Study of the Effect of Altitude on Germination of Seeds, by A. M. Lute, M. L. Thornton, and K. Dixon (pp. 83–86) (both Colo.); Germination Studies of Carrot Seed, by M. N. Patterson (pp. 73–75) (Alta.); and A Comparison of the Blotter Test With the Daylight Test for Germinating Orchard Grass Seed, by C. Fuhr (p. 75) (Mo.).

The papers presented at the twenty-fourth annual meeting at Toronto, Ont., August 11–13, 1931, included Progress Report of Germination Research Using Soil, by B. Towers (pp. 102, 103), and California Weed Problem, by W. S. Ball (pp. 161, 162); Progress Report of Soil Germination Work at the Missouri Laboratory, by C. Fuhr (pp. 103, 104) (Mo.); Areas in Which Johnson Grass and Annual Yellow Sweet Clover May Produce Seed, by J. C. Ayres (pp. 105, 106); Alfalfa Seed Producing Areas of the United States and Canada, by E. P. Emack (pp. 107–109); Laboratory Germination of Weed Seeds, by H. Cross (pp. 125–128), and Seed Drill Surveys, by G. A. Elliott (pp. 136–141) (both Ont.); Variations in Duplicate Germination Tests, Especially of Alfalfa and Sweet Clover, by O. A. Stevens (pp. 115–120); Germination Tests With New Zealand Spinach, by M. N. Patterson and B. F. Forward (pp. 121, 122) (Alta.); Investigations in the Germination of New Zealand Spinach Using Eight Different Methods, by F. H. Pipe and A. Hope (pp. 122–125) (N. B.); Pathological Aspects of Seed Testing, by R. H. Porter (pp. 128–131) (Iowa) (E. S. R., 79, p. 641); Weeds Introduced Into the Garden Through Packet Vegetable Seeds, by O. H. Sipple (pp. 151, 152) (N. Y. State); The Direct Method of Germination Testing as Applied to *Dactylis glomerata* and *Poa pratensis*, by A. F. Musil (pp.

141–147) (U. S. D. A.); Canada Thistle Seed Production and Viability in Montana and Its Occurrence in Crop Seeds, by W. D. Hay (pp. 152–155) (Mont.); Distribution of Weed Seeds in Minnesota and the Source of Samples Containing Noxious Weed Seeds, by R. U. Crouley (pp. 159, 160); Weed Control in Redwood County, Minnesota, by A. H. Larson (pp. 165–168) (Minn.); and Canadian Weed Survey, by H. Groh (pp. 163–165) (Ont.).

Articles presented at the twenty-fifth annual meeting held at Fargo, N. Dak., August 9–11, 1932, included Establishing Confidence in Seed Testing, by F. H. Hillman (pp. 204–208), Report of the Sub-Committee on Soil Tests, by E. H. Toole (pp. 187, 188), Simple Equipment for Examining Seedlings for Fluorescence, by E. Brown and E. H. Toole (pp. 222, 223), and Misbranded Seed in Interstate Commerce, by W. A. Davidson (pp. 230–234) (all U. S. D. A.); Control Fields or Trial Grounds a Requisite to the Seed Laboratory (p. 217) and New and Promising Substrata for Seed Viability Tests (p. 225), both by M. T. Munn (N. Y. State); Report on Seed Germination Work in Soil at the California Laboratory, by B. Towers (pp. 189, 190); A New Sampler for Sampling Seed in the Sack, by C. W. Leggatt (pp. 192–195) (Ont.); Identification of Seeds of Yellow-Blossom and White-Blossom Sweet Clover—Report of Progress, by W. O. Whitcomb (pp. 196–199) (Mont.); Production, Cleaning, and Distribution of the Seeds of Clovers and Timothy in the Northwestern States, by E. W. Norcross (pp. 213–217) (N. Dak.); Detection of Seed Borne Parasites, by R. H. Porter (pp. 218–222) (Iowa); and Weed Control in Saskatchewan, by S. H. Vigor (pp. 226–230) (Sask.).

Papers presented at the twenty-sixth annual meeting held at Chicago, Ill., June 28–30, 1933, included Report of the Sub-Committee on Time of Flowering and Viability of Weed Seeds, by F. E. Foulds (pp. 249–254) (Man.); Identification of Seeds of Yellow Blossom and White Blossom Sweet Clover—Conclusion, by W. O. Whitcomb (pp. 254–262) (Mont.) (see above); Summary of Two Years of Research of Seed Germination in Soil at the Missouri Laboratory, by C. Fuhr (pp. 263–265); Twenty-Five Years of Germination Testing, by W. L. Goss (pp. 275–278), and Dormancy Occurring in Freshly Harvested Salsify Seed, by B. Towers (pp. 286, 287); Observations Upon the Movement of Seeds in Bags When Sampled With Instruments (pp. 278, 279) and Soil Tests Necessary to Measure Vitality of Some Seed Stocks (pp. 285, 286), both by M. T. Munn, A Fractional Method Adapted to the Analysis of Orchard Grass, by M. E. Woodbridge (pp. 279–282), Abnormal Germination of Wheat Caused by Organic Mercurials, by W. F. Crosier (p. 284) (E. S. R., 79, p. 641), and Some Suggestions for the Prevention of Erratic Germination of Lettuce Seed, by A. L. Shuck (pp. 284, 285) (all N. Y. State); A Suggested Germinator for Testing Bluegrass, by B. F. Forward (p. 283) (Alta.); and Notes on Seed Testing, by E. Brown (pp. 288–294) (U. S. D. A.).

Proceedings of the Association of Official Seed Analysts of North America, 1937 (*Assoc. Off. Seed Anal. North Amer. Proc., 29 (1937), pp. 151, figs. 6*).—The papers presented at the twenty-ninth annual meeting at Washington, D. C., August 23–26, 1937, included Hard Seeds in Legumes—Summary of Labeling Requirements of State Laws and Methods of Reporting by Laboratories (pp. 33–37) and Hard Seeds in Legumes—Correlation Between Laboratory and Field Germination (pp. 138–145), both by W. O. Whitcomb (Mont. Expt. Sta.); Rules and Recommendations for Testing Seeds Association of Official Seed Analysts of North America (pp. 61–84) (see p. 45); Controlling Flower Seed Sales (pp. 89, 90) and Fluorescence Readings of the Strains of the Species of *Lolium* (pp. 136, 137), both by M. T. Munn, The Pathogenicity of *Fusarium* spp. in Commercial Pea Seed (pp. 112–116) and Influence of Chemical and Soil Factors Upon the Germination of Seeds of Small Grains (pp. 126–129), both by W. Crosier, The Value of Chemical Seed Treatments in Germination Studies, by W. Crosier and S. Patrick (pp. 117–121), and Commercial Significance of Hard Seeds in Peas, by S. Patrick and W. Crosier (pp. 146, 147) (all N. Y. State); Application of the Chi-Square Test to Purity Analyses of Bluegrass Seed, by R. H. Porter (pp. 91–93), A Possible Modification in Purity Analyses of Orchard Grass, by N. K. Seiferle and R. H. Porter (pp. 94–96), and Germination of Treated and Untreated Pea Seeds in Autoclaved and Unautoclaved Soil (pp. 121–125) and Germination of Cucurbit Seed in Sand (pp. 133–135), both by G. N. Davis (all Iowa); Some Comparative Studies on Blowing Methods of *Poa pratensis*, by F. M. Torpy, E. F. Sirrine, and E. H. Toole (pp. 97–102), The Value of Incidental Seeds Found in Samples of Commercial Seeds, by E. F. Sirrine (pp. 102, 103), Opening Discussion of Round Table on Seed Germination Problems, by E. H. Toole (pp. 129–133), and Testing Seed of *Paspalum dilatatum*, by V. K. Toole and E. F. Sirrine (p. 148) (all U. S. D. A.); Short Note on a New Blower, by C. W. Leggatt (pp. 103–105) (Ont.); and Vegetable Seed Treatment Experiments and Practices in Virginia, by H. T. Cook (pp. 105–111) (Va. Truck).

Rules and recommendations for testing seeds (*U. S. Dept. Agr. Circ. 480 (1938), pp. 24*).—These rules and recommendations, adopted by the Association of Official Seed Analysts of North America, August 27, 1937, superseding the rules published earlier (E. S. R., 56, p. 531), outline procedure for sampling seed; testing for purity, germination, and variety; determinations of moisture content and seed-borne diseases; and for evaluation and reports.

Seed inspection in Kentucky, 1937–1938, W. A. Price, E. C. Vaughn, E. Deen, H. Tilson, H. T. Shacklette, J. Taylor, A. McDaniel, K. Fried, and M. Morton (*Kentucky Sta. Regulat. Ser. No. 16 (1938), pp. 34*).—The purity, germination, and presence of excessive quantities of noxious weed seed are reported for 630 official samples of agricultural seed obtained during the year ended June 30, 1938.

Weeds of arable land, H. C. Long (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 108 (1938), pp. V+215, pls. 14, figs. 85*).—This practical weed manual indicates general methods for control of weeds and specific control measures with descriptions for weeds pertaining to different botanical families. Information also is included on losses caused by weeds, their distribution and relation to soil type, seed testing in relation to control, and the presence of weed seeds in forage crop seeds. A glossary, a short bibliography, and an index are also included. See also another note on weeds of grassland (E. S. R., 68, p. 42).

Rout the weeds—why, when, and how, L. R. Tehon (*Ill. Nat. Hist. Survey Circ. 28 (1937), pp. VI+34, figs. 9*).—Practical information is given on weeds as economic factors, as hosts of insects and plant diseases, their relation to public health, and control methods. The characteristics, distribution, biology, and control are described for common and giant ragweeds, poison-ivy, poison sumac, wild parsnip, white snakeroot, pokeweed, and common burdock.

Crab grass control in the lawn, L. E. Longley. (Univ. Minn.). (*Minn. Hort., 66 (1938), No. 5, pp. 83, 84*).—Control measures indicated include a heavy bluegrass stand, pulling out young crabgrass by hand, mowing and fertilizing, free use of ammonium sulfate, and spraying with sodium chlorate solution.

Grazing in relation to the control of leafy spurge, E. A. Helgeson and E. J. Thompson. (N. Dak. Expt. Sta.). (*Science, 88 (1938), No. 2272, p. 57*).—Experiments in the summer of 1937 demonstrated that sheep will eat leafy spurge (*Euphorbia virgata*) without harmful effects and keep it under control.

HORTICULTURE

[Horticulture at the Georgia Coastal Plain Station, 1936] (*Georgia Coastal Plain Sta. Bul. 28 [1937], pp. 11, 12, 76–86, 87–103, 124–129*).—Herein are presented progress statements on variety, fertilizer, cultural, and other studies with tomatoes, watermelons, lima beans, asparagus, corn, and to a lesser extent with various other vegetables. Discussed also are variety studies with fruits and nuts, such as the pecan, peach, pear, plum, grape, fig, jujube, blueberry, citrus, and tung oil. In addition, the results of outlying field trials with onions, lettuce, cabbage, and certain other vegetables are discussed.

[Horticulture at the Idaho Station], L. VERNER (*Idaho Sta. Bul. 225 (1938), pp. 51–53, 54, figs. 2*).—Following a brief historical review of the horticultural work of the station, information is presented on the following studies: Apple breeding, orchard soil management, variety testing of fruits and vegetables, resistance of the Deacon cherry to cracking, and pruning of young apple trees.

[Horticultural studies by the North Carolina Station]. (Partly coop. U. S. D. A.). (*North Carolina Sta. Rpts. 1936, pp. 58–61, 62–65, 67, 68, 70–73, fig. 1; 1937, pp. 50, 51, 52–55, 56, 57, 59, 60*).—Included in the 1936 report are progress statements on studies in peach fertilization and pruning, and dewberry fertilizers, all by C. F. Williams; peach fruit thinning, and soil moisture in the peach orchard, both by I. D. Jones; peach orchard management, by R. E. L. Greene; fruit varieties, by M. E. Gardner and J. G. Weaver; apple pruning, by Gardner; vegetable varieties, by R. Schmidt; raspberry fertilizers, by Gardner; strawberry fertilizers, by Schmidt; raspberry and dewberry breeding, by Williams; spacing of strawberries, by E. B. Morrow; soil conditions unfavorable to strawberry production, by J. J. Skinner, R. A. Lineberry, and H. B. Mann; fertilization of vegetables on mountain soils, by Gardner and Schmidt; tomato and lettuce breeding, both by Schmidt; rose and carnation varieties, propagation of carnations and begonias, and the photoperiod response in the aster, all by G. O. Randall; carnation breeding, by Randall and Weaver; and the use of sawdust impregnated with copper sulfate as an ameliorant of soils for floral crops, by Weaver and L. G. Willis.

In the 1937 report are discussed projects in peach fertilization in the Sandhills, by Williams; peach fruit thinning, by Jones; peach fertilization in the Piedmont, fruit varieties, and apple pruning, all by Gardner; small fruit breeding, and dewberry fertilizers, both by Williams; raspberry fertilizers, by Gardner; strawberry spacing, by Morrow; strawberry production, by Lineberry, E. R. Collins, and Skinner; tomato breeding, lettuce breeding, and vegetable varieties, all by Schmidt; fertilizers for vegetables, by Gardner and Schmidt; production of flowering bulbs, by Randall, Weaver, S. L. Emsweller, and D. V. Lumsden; and propagation of floral crops, and carnation and rose varieties, all by Randall and Weaver.

[Horticultural studies by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 360 (1938), pp. 27, 28, 33, 34, 38, 39, 44, figs. 2*).—Observations are included on the following projects: Mushroom culture, vegetable breeding, vegetable fertilization, cabbage and tomato breeding, orchard management, rootstocks for apples and cherries, soil conservation in the orchard, and the nutrition of the apple tree.

Water conditioning for greenhouses, C. H. SPURWAY and C. E. WILDON (*Michigan Sta. Circ. 166 (1938), pp. 10, figs. 2*).—Herein is presented a description with discussion as to operation of an apparatus designed for neutralizing the carbonate alkalinity or carbonate hardness of water. The effect of carbonate hardness in water on plants and the underlying principles of water conditioning are discussed. In general, the conditioned water maintained the pH value of the soils at about the same level or slightly lower than did distilled water, and increased markedly the soluble phosphorus content of the soils.

Stock and scion terminology, H. B. Tukey. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 378–382*).—Based on a study of the literature and on communications with other workers, the author discusses certain terms used in the literature of plant propagation and suggests the most appropriate terminology in the light of present usage.

Questions and answers relative to asparagus production, L. G. Schermerhorn, V. A. Tiedjens, K. R. Slamp, B. B. Pepper, C. H. Nissley, C. M. Haenseler, and G. B. Crisp (*New Jersey Stas. Bul. 650 (1938), pp. 22, fig. 1*).—Based on results of station studies and other sources, general information is presented by the question-and-answer method on production and consumption trends, culture, control of insects and diseases, and preparation for market.

Determination of stringiness in celery, D. S. Curtis (*[New York] Cornell Sta. Mem. 212 (1938), pp. 20, figs. 6*).—Of three methods employed in testing celery for mechanical resistance, namely, (1) resistance to a crosscutting wire, (2) resistance to a probe, and (3) tensile strength, the third was found the most reliable. In each method force was applied by means of the Schopper strength tester. The strongest elements on the petiole were the collenchyma strands, which in the very immature stage were relatively soft and tender and could be stretched 18 percent of their length. With development, the collenchyma strands became hard and strong and could not be stretched, the changes being due, apparently, to alterations in the colloidal properties of the cell walls, notably a loss in the ability to absorb water. Vascular bundles also became stronger with age but were always weaker than the collenchyma strands. Because of their easy separation, the vascular bundles are more conspicuous than the collenchyma strands. The structural arrangement by which collenchyma, parenchyma, and vascular bundles merge into one another was a factor in stringiness.

Marked differences were recorded between varieties in size, strength, and elasticity of similar tissue elements. Wilting of celery for 10 days at 70° F. caused no significant change in tensile strength of either the collenchyma or the vascular tissues. In the absence of decay, collenchyma showed no change in mechanical resistance after 5 months' storage at 32°. High moisture supply resulted in stronger collenchyma tissue, due primarily to the effect of the hardening process, which is more advanced in the larger and maturer petioles.

Relation of number of seeds to fruit size and shape in cucumbers, H. L. Seaton. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 654–658*).—Highly significant differences were found in the weight, length of fruit, length of seed cavity, and numbers of fully developed and aborted seeds in the constricted portions between normal and constricted fruits of the National Pickling cucumber. There was a close relationship between the number of fully developed seeds, and the extent of development of the surrounding fleshy tissues. This relationship between seed development and tissue development suggests that pollination may be involved. It has been found that under one set of conditions a large percentage of the flowers produce straight fruits, while the next day under altered conditions fully 90 percent of the ovaries may develop into fruits with stem-end constrictions, and under slightly different conditions an equal percentage of the ovaries will develop into fruits with blossom-end constrictions.

The effect of fertilizer placement on the germination and growth of Pisum sativum, M. M. Parker. (Va. Truck Expt. Sta.). (*Va. Acad. Sci. Proc., 1937, p. 52*).—Of seven fertilizer mixtures applied at the rate of 1,000 lb. per acre to garden peas, those mixed with the soil before planting, placed above the seed on the surface after planting, or placed in a band 3 in. below the seed, resulted in decreased germination. Many of the seeds that germinated showed injury, and with all three placements the injury occurred on the tap root near the seed and not at the extremities of the secondary roots. The injurious effects were noticeable throughout the growth of the plant, and the severity and amount of injury was correlated with the composition of the fertilizer. On the other hand, fertilizer placed in bands on each side of the row and below the seed level did not influence germination.

Pruning staked tomatoes, J. J. Woods (*Sci. Agr., 18 (1938), No. 10, pp. 620–626*).—At Agassiz, B. C., outdoor Bonny Best plants pruned to four or less trusses matured more of their fruits early but yielded less total fruits than plants with more fruiting area. Somewhat different results with an unnamed tomato indicated that variety may be a factor. A delay in pruning tended to increase yields. A moderate plan in which plants were pruned to a single stem and allowed to attain full height gave better results.

The occurrence of apple blossoms with prolonged central axes and its bearing upon flower morphology, H. B. Tukey. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 117–127, figs. 5*).—Buds taken from vigorous trees of the Early McIntosh apple developed during the succeeding season in many instances into flower buds rather than vegetative buds, as was expected. These flowers showed various degrees of increase, suppression, and replacement of floral parts, with the pistil most frequently affected, being replaced by median foliar prolifications. Examination of tissues involved in the enlargement of the toral region showed a greater number of cells in the pith, xylem, phloem, pericycle, and inner and outer cortex. These vegetative blossoms supported the view that the apple fruit is a development of a stem.

Viability of pollen and establishing pollination branches in trees, F. L. Overley and E. L. Overholser. (Wash. Expt. Sta.). (*Oreg. State Hort. Soc. Ann. Rpt., 29 (1937), pp. 197–199*).—Stating that the removal of nonprofitable varieties, leaving solid blocks of Delicious or Winesap, had created a serious pollination problem in many Washington orchards, the authors point out the possibilities of grafting compatible varieties into existing trees and introducing hives of bees or employing hand pollination as a temporary expedient. Germination studies on pollination of Jonathan and Rome Beauty buds in three stages of development showed much better results in the case of open flowers just before the anthers burst.

Anent parthenocarpic apples, F. A. Varrelman (*Science, 87 (1938), No. 2262, p. 414*).—Spraying of emasculated and protected blooms of McIntosh, Sereda, Turley, and Red Astrachan and the parthenocarpic Spencer Navel apples with indoleacetic and naphthaleneacetic acids in various concentrations failed to induce fruit formation in any instance.

Hardiness investigations with the apple, F. Horsfall, Jr., and C. G. Vinson (*Missouri Sta. Res. Bul. 289 (1938), pp. 24, figs. 17*).—Neither ringing of bearing trees just above the crown before dormancy nor trenching around the base at a radius of from 7 to 9 ft. from the trunk to a depth of 20 in. had any significant effect on the carbohydrate content of the crotch, trunk, and lower-limb tissues, whether studied chemically or microscopically. Defoliation of branches of 10-year-old trees in autumn retarded growth the succeeding spring about proportional to the earliness of the defoliation. A smaller annual increment of xylem observed on the upper side of scaffold limbs is attributed to the remoteness of the foliage as caused by the location of secondary branches on the sides and lower parts of scaffold limbs. The smaller amount of elaborated food materials moving on the upper side of scaffold limbs may be a factor in crotch injury by inducing delayed maturity. The removal of large scaffold limbs may result in food shortage and consequent winter-killing in the trunk area adjacent to the wounds. The lower the crotch on the trunk, the greater the hazard from winter injury, due to the greater distance from the foliage in general. Tissue in wide-angled crotches apparently matured earlier and was less susceptible to low temperature than that of narrow crotches.

No pruning compared with light and heavy pruning of apple trees, C. W. ELLENWOOD and J. H. GOURLEY (*Ohio Sta. Bimo. Bul. 193* (*1938*), *pp. 142–146*).—Working with Baldwin and Stayman Winesap trees planted in 1916 and which had received identical soil and spray treatments throughout their life, it was found that pruning, either light or heavy, had reduced yields. Light pruning had a much greater reducing influence on both yield and growth in the Baldwin than in the Stayman Winesap. In the case of Baldwin, even light pruning decreased the income per tree, and in Stayman Winesap the increased value of fruit on lightly pruned trees was so slight as to be insignificant. Certain operations, such as spraying and harvesting, were facilitated by pruning, but the practical suggestion is offered that growers analyze their pruning operations critically.

Relation of atmospheric conditions to enlargement rate and periodicity of Winesap apples, C. P. HARLEY and M. P. MASURE. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *57* (*1938*), *No. 2, pp. 109–124, figs. 8*).—A study was made in the orchard of the relationship between atmospheric conditions as measured by thermograph, atmometer, and anemometer, and time and rate of enlargement of Winesap apples, as measured by continuous growth-recording instruments and by hand tape. Reduction in rate of fruit enlargement, both for the total 24 hr. and for portions of it, was closely associated with increased evaporating power of the air; air movement was very closely associated with the latter and temperature somewhat less so. High temperatures did not directly limit fruit growth; there was some indication of such by temperatures below 50° F. Time and rate of fruit enlargement showed both a pronounced daily periodicity and a distinct seasonal shift, i. e., maximum rates occurred between 10 p. m. and 4 a. m. (July 20 to August 16), 2 and 8 a. m. (August 16 to September 13), 8 a. m. and 1 p. m. (September 14 to October 11), and average daily growths for these periods were 1.89, 1.66, and 1.16 cc, respectively. Minimum and least fluctuating growth occurred between 4 and 6 p. m. throughout the experiment, this period being termed the "mean diurnal minimum," and recommended as the best time for taking daily fruit measurement.

Removal of lead spray residues from apples grown in the Shenandoah-Cumberland Valley, M. H. HALLER, C. C. CASSIL, C. W. MURRAY, J. H. BEAUMONT, and E. GOULD. (Coop. Md. and W. Va. Expt. Stas.). (*U. S. Dept. Agr., Tech. Bul. 622* (*1938*), *pp. 32, fig. 1*)—Studies conducted in 1934 with Jonathan, Grimes Golden, Delicious, Stayman Winesap, and York Imperial apples, and in 1935 with Stayman Winesap alone, indicated that the variety is not an important factor in the amount of residue or ease of removal. The addition of mineral-oil emulsion to the second-brood cover sprays of arsenate of lead greatly increased the lead residues and the difficulty of cleaning. When lime was omitted from the late cover sprays, the amount of residue and difficulty of removal were greatly increased. Heating the washing solution was not found uniformly necessary if an effective wetting agent was added to the acid solution and if mineral oil had not been used more than twice in the late cover sprays. Lead residues remaining after certain washing treatments were closely correlated with residues at harvest, and the percentage removed by a given washing treatment was fairly uniform, suggesting that the necessary washing treatment may often be approximated from the residue at harvest. Greater benefit was obtained from heating combined acid wetting-agent solutions than acid solutions alone. No benefit was obtained from the addition of 1 percent of common salt to a 1.5 percent hydrochloric acid solution. In the case of apples sprayed with lead arsenate and mineral-oil emulsions, the addition of 1 gal. of light mineral oil to 100 gal. of heated acid solution in a flood-brush machine was beneficial. Heated sodium silicate solutions were less effective than heated acid solutions, except where lime had been omitted from the late cover spray. Storage for from 4 to 5 mo. at 32° F. increased the difficulty of removing lead residues, particularly when acid alone was used. Washing apples did not increase decay in storage at 32° whether packed wet or dry. York Imperial showed slight lenticel injury from the acid wetting-agent process and heat injury when washed at 110° for 1.5 min. and considerable injury at 120° for 1 or 1.5 min.

Six years' study of pear irrigation, W. W. Aldrich. (U. S. D. A.). (*Oreg. State Hort. Soc. Ann. Rpt., 29 (1937), pp. 79–87, fig. 1*).—Although water deficits in Anjou pear trees during the first 100 days after full bloom may reduce branch growth and slightly reduce fruit size, deficits in the tree during the final 30 or 40 days before harvest were found more serious in reducing size of fruit and total yield. In the clay adobe soils near Medford, Oreg., water deficits are not serious if the soil moisture anywhere in the upper 3 ft. is prevented from decreasing much below 50 percent of the available capacity. Systematic measurement of the fruit was found a reliable index to moisture needs of the soil.

The effects of water supply to the tree upon storage and dessert quality of Anjou pears grown in clay adobe soil in the Rogue River Valley, A. L. Ryall and F. C. Reimer. (U. S. D. A. and Oreg. Expt. Sta.). (*Oreg. State Hort. Soc. Ann. Rpt., 29 (1937), pp. 74–78*).—Observations on fruits harvested from the several irrigation plats at Medford, Oreg., showed the water content of the pears to be correlated with the amount of available water in the soil at harvest. In general, fruits from trees with the greater water supply were softer at harvest, as indicated by the pressure test, and had more yellow color upon ripening. Fruit from the drier plats was inclined to be more astringent, more acid, firmer, and of a more highly developed flavor. Surface scald was more evident in fruit that had made the more rapid growth late in the season. Watery break-down, on the other hand, was more prevalent in fruit from plats with the lesser water supply near harvest.

Available potassium in orchard soils as affected by a heavy straw mulch, I. W. Wander and J. H. Gourley. (Ohio Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 5, pp. 438–446, figs. 4*).—As a further contribution (E. S. R., 79, p. 333) the authors report that in a pear orchard located on a Mahoning silty clay loam at Strongsville, Ohio, where a heavy mulch had been maintained for a period of from 22 to 38 yr. and where no potassium had been added except as supplied by the mulch, available potassium was very high to a depth of from 24 to 32 in. A lesser amount was found under the adjacent bluegrass sod and a much smaller amount under plats in cultivation with cover crops.

Peach tree root distribution, L. Havis. (Ohio Expt. Sta.). (*Ecology, 19 (1938), No. 3, pp. 454–462, figs. 6*).—Observations in trenches dug beneath 10- to 12-year-old Elberta peach trees located on four soil types showed a close relation between the distribution of the roots and the character of the soil. Greater numbers of larger roots were found at greater depths in Wooster than in Canfield, Volusia (Ravenna), and Trumbull silt loams which were not so well drained. Although a higher percentage of medium and large roots was found in the first foot of the Trumbull than in the other soils, a few of the small roots were found at the maximum depths in this type. Injury in the disastrous winter of 1935–36 was greater in trees on the poorer-drained types of soil.

The Kalhaven peach, S. Johnston (*Michigan Sta. Quart. Bul., 21 (1938), No. 1, pp. 19, 20, fig. 1*).—Brief descriptive information is presented.

A Saucer peach bud variation, A D. Shamel. (U. S. D. A.). (*Jour. Heredity, 29 (1938), No. 7, pp. 258, 259, fig. 1*).—The occurrence of a bud mutant differing from the parental Saucer peach by producing oblong-oval fruits with rather pointed tips is recorded, with the suggestion that the Honey peach may have originated in a similar manner.

Prunus mexicana and Prunus hortulana as rootstocks for peaches, S. Johnston (*Michigan Sta. Quart. Bul., 21 (1938), No. 1, pp. 17, 18, fig. 1*).—Neither species proved satisfactory as a stock for the cultivated peach.

Further studies upon cherry pollination [trans. title], F. Kobel, P. Steinegger, and J. Anliker (*Landw. Jahrb. Schweiz, 52 (1938), No. 5, pp. 564–595, fig. 1; Fr. abs., pp. 594, 595*).—Intersterility was again found (E. S. R., 70, p. 779) to be abundant among Swiss varieties of sweet cherries. All of the 95 varieties examined were without exception self-unfruitful, and at least 50 proved intersterile in certain combinations. Following self-pollination or pollination with intersterile kinds, the pollen tubes were arrested in their growth in the upper part of the pistil, with noticeable swelling of the extremity.

The Seneca cherry for trial planting in Michigan, W. Toenjes (*Michigan Sta. Quart. Bul., 21 (1938), No. 1, pp. 20, 21*).—Information is offered on the characteristics and adaptability to Michigan of this early sweet cherry, originated by the New York Experiment Station.

New or noteworthy fruits.—XII, Small fruits, G. L. Slate (*New York State Sta. Bul. 680 (1938), pp. 18*).—Continuing the series (E. S. R., 69, p. 367), 14 new varieties of small fruits, 11 of which originated at the station, are described and evaluated. The new varieties include 4 red raspberries, Indian Summer, Marcy, Monroe, and Taylor; 3 black raspberries, Bristol, Dundee, and Evans; 2 purple raspberries, Marion and Sodus; 1 currant, Red Lake; and 4 strawberries, Camden, Catskill, Dorsett, and Fairfax.

Some strawberry breeding progeny data, B. D. Drain and L. A. Fister. (Tenn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 60–66*).—Selfing of varieties such as Klondike, Aroma, Blakemore, and Dorsett yielded mostly seedlings of low vigor and susceptibility to low temperature, disease, and insects The value of Aroma, Missionary, Klondike, Gandy, Dorsett, Blakemore, Howard 17, Howard Supreme, and other varieties as parents is discussed. For the greater part, the crossed seedlings were much more vigorous than the selfed. Missionary, Klondike, Blakemore, and Howard 17 were the most promising parents used. Data on vigor, time of ripening, and characters of the fruit are presented for the various progenies.

Pruning and fertilization experiments with Concord grapes, J. R. van Haarlem and W. H. Upshall (*Sci. Agr., 18 (1938), No. 9, pp. 485–499, figs. 2*).—Overpruning reduced the total crop, with some compensation in larger bunches and berries, and slightly increased the sugar content of the juice. Extreme overpruning resulted, however, in lower sugar and higher acid in the juice. Underpruning gave small bunches and small berries, with the fruit ripening normally as measured by the sugar and acid contents of the juice. However, continued underpruning resulted in weak vines subject to drought and freezing injury. A reduction of acid content was found more important than an increase in sugar content in improving the eating quality of grapes during the last few days before harvesting. No fertilizer had any appreciable influence on sugar or acid contents. Nitrate of soda used alone was ineffective in increasing growth or fruiting, and apparently caused a slight depression in these two respects. Yields were not materially affected by any fertilizer combination, but that of nitrate of soda, phosphate, and potash gave the greatest response. On the other hand, the turning-under of organic materials, such as straw and green manures, resulted in marked increases in growth and fruit. As observed, very little, if any, phosphate and potash applied to the surface penetrated below 6 in., and since the roots were found rather deep it is concluded that they had had little access to the added minerals.

The Khalili as a parent for breeding early grapes, R. Wellington (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 76–79*).—Several seedlings obtained from crosses of Khalili with promising station seedlings are described. Some very early ripening grapes of excellent quality indicated that Khalili may have considerable value in the production of early maturing grape varieties.

Muscadine grapes: Culture, varieties, and some properties of juices, M. M. Murphy, Jr., T. A. Pickett, and F. F. Cowart (*Georgia Sta. Bul. 199 (1938), pp. 32, figs. 15*).—This revision (E. S. R., 72, p. 779) presents in a like manner information as to cultural practices, propagation, pollination, varieties, physical and chemical properties of the juice, etc.

Outline of ampelography for the vinifera grapes in California, F. T. Bioletti (*Hilgardia [California Sta.], 11 (1938), No. 6, pp. 227–293, figs. 28*).—The author presents a classification based on the characters of the fruit, vine, and foliage to serve as an aid in distinguishing and grouping the numerous California-grown varieties of vinifera grapes. The significance of various characters, such as form of fruit cluster, berry color and shape, seed number and shape, juice color and flavor, adherence of the berry to the stem, morphology of leaves, type of bark, etc., is considered in detail.

Carbohydrate metabolism of Vitis vinifera: Hemicellulose, A. J. Winkler and W. O. Williams. (Univ. Calif.). (*Plant Physiol., 13 (1938), No. 2, pp. 381–390*).—Determinations of the hemicellulose content of representative cross sections of the stems and roots of the Carignane grape collected at frequent intervals throughout the year showed a striking lack of significant variation between the samples of each series except that for the base of the shoots. Here the basal wood was very succulent in April, and the hemicellulose content at this stage was less than half of that later. The appearance of a normal hemicellulose content during the period of rapid growth and before starch storage began actively is deemed evidence of hemicellulose usage as structural material. The average hemicellulose content of repeatedly defoliated vines was almost identical with that of normal vines, indicating that hemicellulose was not used as a food reserve under severe conditions.

How much water does a date palm use? A. F. Pillsbury. (Univ. Calif.). (*Date Growers' Inst. Rpt., 14 (1937), pp. 13–16, fig. 1*).—Based on studies in several commercial Deglet Noor date gardens, the author concludes that the date has a high water requirement, especially during the summer months. The records indicated that palms take an average of five-sixths of their moisture from the top 4 ft. and one-tenth from the 4- to 6-ft. level. Apparently, soil-moisture deficiency was reflected rather quickly in the leaf growth rate, and measurements of growth are considered promising as a means of determining the adequacy of irrigation treatments.

The crude fat content of date skins correlated with moisture damage, R. H. Hilgeman and J. G. Smith. (Ariz. Expt. Sta.). (*Date Growers' Inst. Rpt., 14 (1937), pp. 16, 17*).—Crude fat determinations of the skins of six varieties of dates ranging from the most easily damaged to the most resistant showed in soft varieties a definite relationship between crude fat content and resistance to rain damage. Deglet Noor, a semisoft variety, proved to be an exception.

On the relation between vigor of scion variety and rootstock reaction in the lemon, R. W. Hodgson, E. R. Eggers, and S. H. Cameron. (Univ. Calif.). (*Calif. Citrog., 23 (1938), No. 7, pp. 290, 306, figs. 2*).—Observations on pairs of Eureka and Lisbon lemon trees growing on four rootstocks, namely, sweet orange, grapefruit, rough lemon, and sour orange, indicated that sweet orange was the best and sour orange the poorest stock for the Eureka lemon. No significant differences were recorded between the rootstocks in the case of the Lisbon lemon. Grapefruit and rough lemon were comparable in their effects on the Eureka lemon scion.

Garden bulbs in color, J. H. McFarland, R. M. Hatton, and D. J. Foley (*New York: Macmillan Co., 1938, pp. XXIV+296, [figs. 367]*).—This book presents illustrations and definitions of the various types of daffodils, narcissi, tulips, lilies, and other bulbs. The text is supplemented by an abundance of colored photographs and drawings of the various species.

Inducing root-formation on dormant rose cuttings, H. R. Rosen. (Ark. Expt. Sta.). (*Amer. Rose Mag., 2 (1938), No. 9, pp. 147, 148*).—The author reports favorable results with a commercial growth-promoting preparation used on cuttings made from dormant Setigera hybrid roses growing outdoors.

FORESTRY

[Forestry at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 360 (1938), pp. 36, 37, fig. 1*).—Included are brief comments on species, spacing trials, planting mixtures, and other silvicultural details.

Forest resources of the north-Louisiana delta, R. K. Winters, J. A. Putnam, and I. F. Eldredge (*U. S. Dept. Agr., Misc. Pub. 309 (1938), pp. V+49, pl. 1, figs. 11*).—Information is presented on the general description of the timber, its increment, forest-product industries, the present situation, and future developments.

Diagnosing plantation mortality, P. O. Rudolf. (U. S. D. A.). (*Mich. Acad. Sci., Arts, and Letters, Papers, 23 (1937), pp. 333–338, pl. 1, fig. 1*).—Examination of the root systems of some 5,200 trees in 26 plantations in the Huron National Forest, Michigan, indicated that heat caused the greater part of the mortality in new plantings. Heat injury was evident in a discolored ring of cambium, usually within 1 in. of the soil surface. Neither soil pH nor colloidal content showed significant correlation with survival. The observations point to the use of larger nursery stock and of protective covers to lower the surface soil temperatures.

Influence of foliage sprays on drought resistance of conifers, H. L. Shirley and L. J. Meuli. (U. S. D. A.). (*Plant Physiol., 13 (1938), No. 2, pp. 399–406, fig. 1*).—Neither in the laboratory nor in the field did the evergreens, Norway and white pine and white spruce, when sprayed with various wax and rubber emulsions exhibit any significant advantage in point of drought resistance over the unsprayed. In the case of two materials, the mortality was greater than in the controls. The more effective sprays caused an important reduction in transpiration during the first 4 days, but thereafter the rate was about the same as that of the unsprayed plants.

Layering in black spruce (Picea mariana (Mill.) BSP.), F. C. Gates. (Kans. Expt. Sta. et al.). (*Amer. Midland Nat., 19 (1938), No. 3, pp. 589–594, figs. 4*).—A description is presented of the layering process in black spruce as observed in Sphagnum-Chamaedaphne muck swamps of northern Michigan.

The influence of soil treatment on jack-pine reproduction, R. K. Le Barron and F. H. Eyre (U. S. D. A.). (*Mich. Acad. Sci., Arts, and Letters, Papers, 23 (1937), pp. 307–310*).—Three soil treatments, (1) nothing, (2) partially torn up, and (3) duff removed, were compared in uncut, partially cut, and clear-cut plats established in a heavily stocked, 70-year-old stand of jack pine admixed with black spruce, paper birch, and aspen. There was a tremendous increase in reproduction on the clear-cut area where the duff was removed and slash left on the soil. Burning of the slash greatly reduced reproduction, due, apparently, to destruction of the seed, but it is conceded that light burnings might not be as harmful.

Some profile characteristics of the pine-growing soils of the Coastal-Plain region of Arkansas, L. M. Turner (*Arkansas Sta. Bul. 361 (1938), pp 52, figs. 8*).—Based on field observations, physical analyses, and pH determinations of soils on 222 plats in 4 counties in which the soils were grouped according to site indexes ranging from 60 to 110 it was found that the greater the slope the slower was the height growth rate. Loblolly pine was usually absent in sites of greater than 7 percent slope. Where the slope was less than 1 percent, growth was minimized due to poor surface drainage. Shortleaf pine was particularly susceptible to surface drainage. Except in the more steeply sloping soil phases, deep, loose-structured A and B horizons were conducive to best growth. The best group of soils included no phases that were decidedly lacking in nitrogen or phosphorus, and the poorest had none that were high in these elements. Soil reaction was apparently not important in its effect on growth rate of the two species, with the average pH values of the A and B_1 horizons occurring largely between 5 and 6. Under the conditions prevailing, the direction of the slope had a negligible effect on growth rate.

A highly significant correlation was recorded between the rate of height growth of the two pines and percentage of slope where the percentage exceeded 3. A definite correlation was observed between rate of height growth and depth of the B_1 horizons and also with the clay content of the B_2 horizon. No significant correlation and a slightly significant correlation were noted, respectively, between rate of height growth and clay contents of the B_1 and the A horizons. The coefficient of correlation with clay content was positive in the case of the A, and negative in the B_1 and B_2 horizons. Apparently, the interaction of several factors was more influential than that of any single factor in determining the rate of height growth of shortleaf and loblolly pines in the area studied.

Knots in second-growth pine and the desirability of pruning, B. H. Paul (Coop. Univ. Wis.). (*U. S. Dept. Agr., Misc. Pub. 307 (1938), pp. 36, figs. 29*).—Studies in six species—*Pinus strobus*, *P. resinosa*, *P. taeda*, *P. echinata*, *P. caribaea*, and *P. palustris*—show that in the first two artificial pruning is essential for the production of any of the best grades of lumber within a reasonable period of years. The pruning wounds of *P. strobus* healed in from 3 to 5 yr. and in *P. resinosa* in from 5 to 7 yr. The other four species were found to clear their branches more readily under natural conditions. The value of pruning was shown in 90 percent knot-free lumber in white pine trees pruned 40 yr. before cutting.

The method of cutting consisted in sawing the logs so that a longitudinal section of every knot was revealed. No correlation was established between the diameter of a branch and the number of years it persisted after death.

Stave volume and defect in old-growth white oak, R. D. Stevens (*Arkansas Sta. Bul. 362 (1938), pp. 26, figs. 8*).—Measurements of tree boles on old-growth stands indicated that curves based on the smaller diameter-breast-high classes could not be extended on their trend to include the larger diameters because the smaller groups almost invariably showed too much taper. The taper was rapid in the lower lengths of the stem, particularly in the case of the larger diameters. Individual variations in stem form were rather large, with old-growth white oak generally approaching a cylinder above the point affected by the root swell. There was, on the whole, a greater amount of cull, less net volume, and less gross volume per tree for beer-stave than for bourbon-stave utilization. Girard's tables were found the best available for the Ozark region.

Cull studies based on 4,003 trees included in the bourbon-stave operation and on 1,015 trees in a beer-stave operation led to the conclusion that the cull volume per tree and the number of total cull trees averages higher in the beer-stave operation, largely because of the utilization methods followed. The amount of total cull in old-growth white oak in the Ozark region was extremely high, and decay was the largest single contributing cause. Water soak and rot were the most commonly associated defects, bearing out the hypothesis that soak as it progresses down the tree is an incipient stage of rot.

DISEASES OF PLANTS

The Plant Disease Reporter, September 1, 1938 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 22 (1938), No. 16, pp. 341–352*).—The following items are included: Potato late blight—occurrence in Wisconsin and western New York; the tomato disease situation in Lavaca and De Witt Counties of Texas in 1938, by A. L. Harrison; onion downy mildew and other diseases of vegetable crops in Ohio, by J. D. Wilson; other reports on vegetable diseases, including potato "blight" in Maine, bacterial blights of bean in western Nebraska, and celery blights in western New York; damage from wheat scab in Illinois and Minnesota; wheat diseases in the Northwest, including foot rot in Idaho and Washington, stripe rust, leaf rust, and stem rust in Idaho and Washington, and rusts and other diseases in Washington; rice diseases in Texas and Arkansas, by E. C. Tullis; other reports on diseases of cereals, including wheat diseases in Utah, diseases of small grains in Arizona, and bacterial wilt of corn in Illinois; stem galls of *Forsythia* and coralberry produced by *Phomopsis*, by N. A. Brown; some diseases reported from New Jersey, including leaf blight of hawthorns caused by *Entomosporium thuemenii*, and the pink patch disease of turf caused by *Corticium fuciforme;* and additions to the fungous flora of the Peavy Arboretum (*Puccinia rubigo-vera* and *Septoria elymi* on leaves of *Elymus glaucus*), by G. R. Hoerner.

[Plant disease work in Georgia]. (Partly coop. U. S. D. A.). (*Georgia Coastal Plain Sta. Bul. 28 [1937], pp. 10, 11, 12, 104–107, 115–123, figs. 2*).—Progress reports are included on work with tobacco blue mold in plant beds and its control; cantaloups resistant to leaf diseases; tomato seedling diseases; root knot nematode control, including chemicals as soil nematocides, and resistance of vegetable varieties; cowpeas in relation to root knot; and tobacco diseases, including blue mold control by spraying (copper-oxide-oil and copper-molasses-oil sprays and their preparation) and by gas treatments, its control in hotbeds, and general recommendations for blue mold control, damping-off (*Rhizoctonia* and *Pythium*), *Sclerotium rolfsii* causing southern root rot or sore shin, root knot and recommendations for its prevention, and brief notes on other tobacco diseases.

[Plant disease work by the Idaho Station] (*Idaho Sta. Bul. 225 (1938), pp. 10, 55–59, fig. 1*).—Progress is noted relative to iron salts giving temporary correction of lime-induced chlorosis in apple trees, reported by H. P. Magnuson;

breeding bean varieties resistant to diseases, fruit disease studies, development of promising mosaic-resistant potato seedlings, commercial tests of the new Norida bean, selection and testing of pea crosses for resistance to diseases (coop. Calif. Expt. Sta.), and cereal disease investigations (coop. U. S. D. A.), all reported by C. W. Hungerford, who also briefly summarizes the history of plant disease work by the station.

Kansas mycological notes, 1936, C. O. Johnston, C. L. Lefebvre, and E. D. Hansing. (U. S. D. A. and Kans. State Col.). (*Kans. Acad. Sci. Trans., 40 (1937), pp. 69–74*).—This is largely a summary of plant disease conditions in the State for the 1936 season.

[Plant disease studies in North Carolina] (*North Carolina Sta. Rpts. 1936, pp. 27, 28, 32–35, 61, 62, 66, 67; 1937, pp. 35–37, 44, 45, 46, 51, 52, 56, 61, 63*).—Brief reports of progress are given in the 1936 report on cottonseed treatments, by S. G. Lehman; studies of cotton spots and stains, by O. P. Owens; tobacco mosaic, by Lehman; soil treatments for tobacco black shank (*Phytophthora nicotianae*), and chemical soil treatments for *Bacterium* (=*Phytomonas*) *solanacearum*, both by R. F. Poole; *Sclerotium rolfsii* stem and root rot of various plant species, by H. E. Eaddy; and the effects of copper compounds on the control of *B.* (=*P.*) *pruni* and on the peach foliage, fertilization (especially potash) in relation to infection by this organism and chemical analyses of resistant and susceptible peach varieties, the effects of potash salts in reducing losses from *Fusarium batatatis* wilt or stem rot of sweetpotatoes, and a study of *Ceratostomella fimbriata* black rot of sweetpotatoes, all by Poole. The 1937 report deals with treatments for Granville tobacco wilt due to *Bacterium* (=*Phytomonas*) *solanacearum*, by Poole; the relation of chemical and soil factors to parasitic diseases of plants, with special reference to Granville tobacco wilt, by R. W. Cummings; the effects of soil treatments on the control of tobacco black shank, by Poole; tobacco mosaic, by Lehman; southern root rot or stem blight due to *Sclerotium rolfsii*, by Eaddy; seedling diseases of cotton and seed treatment, by Lehman; cotton stains, by Owens; the effects of copper compounds on the control of peach bacteriosis due to *B.* (=*P.*) *pruni*, the effects of cultural practices on the control of this disease, the absorption of chemicals by sweetpotato plants in relation to *Fusarium batatatis* wilt control, and soil treatments for the *S. rolfsii* disease of peanuts, all by Poole; and cowpea resistance to *F. vasinfectum* wilt and root knot caused by *Heterodera marioni*, by P. H. Kime, Owens, and Poole.

Some new grass smut records from the Pacific Northwest, G. W. Fischer. (U. S. D. A. and Wash. Expt. Sta.). (*Mycologia, 30 (1938), No. 4, pp. 385–395, figs. 3*).—Includes *Ustilago sitanii* and *Tilletia pallida* as new species.

Effect of sodium citrate on release of curly-top virus from alcoholic precipitate of plant juice, J. M. Fife. (U. S. D. A.). (*Phytopathology, 28 (1938), No. 8, pp. 561–574, figs. 6*).—Sodium citrate proved very effective in releasing this virus from the alcoholic precipitate of sugar beet leaf juice or tomato plant juice. Maximum infection was obtained with 6.8 mM sodium citrate. Where the extractable virus content of the plant juice was low, as shown by the percentage infection obtained with water as the extracting solution, the sodium citrate method proved far superior to that using water alone. The virus is not irreversibly inactivated in the juice at pH values as low as 2.2, since infection was obtained by extracting the alcoholic precipitate gained after such exposures with sodium citrate. The virus apparently was only fixed in such a way that water was incapable of liberating it from the precipitate. It is believed that these results may be explained on the basis of electrokinetic effects produced by the sodium citrate.

Suggested role of alkaloids in plants resistant to Phymatotrichum omnivorum, G. A. GREATHOUSE. (U. S. D. A. and Tex Expt. Sta.). (*Phytopathology, 28 (1938), No. 8, pp. 592, 593*).—The results of this study of 125 plant species containing alkaloids indicated 83 to fall within the resistant and immune groups, thus suggesting that alkaloids play a role in the mechanism of resistance of some plants to *P. omnivorum.*

Susceptibility of crop plants and weeds to Sclerotium rolfsii, J. S. COOLEY. (U. S. D. A.). (*Phytopathology, 28 (1938), No. 8, pp. 594, 595*).—A block of nursery trees at Beltsville, Md., infected with *S. rolfsii*, was removed and a part of the land planted to 12 different plants. Korean *Lespedeza stipulacea* showed a high degree of susceptibility, while pepper, tomato, soybean, navy bean, kidney bean, red mammoth and alsike clovers, spring oats, and several weeds showed little or none.

Notes on some Ustilaginales from India, G. P. CLINTON and G. L. ZUNDEL. (Conn. [New Haven] Expt. Sta. and Pa. State Col.). (*Mycologia, 30 (1938), No. 3, pp. 280, 281*).—An annotated list of 11 smut fungi.

Chlamydospore production on artificial media by Urocystis gladioli, C. C. WERNHAM. (Pa. State Col.). (*Phytopathology, 28 (1938), No. 8, pp. 598–600, fig. 1*).—A gladiolus bulb smut at Fairview, Pa., was tentatively identified as *U. gladioli.* This is believed to be the first report of this fungus in America. Smut spore balls streaked on potato dextrose agar germinated in 12 hr. and produced chlamydospores in 10 days. Spores from diseased bulbs and agar slants were alike in that both germinated like *U. cepulae*, concurring with an observation by H. Kneip for *U. anemones.*

Pathological polyploidy in seedlings of corn and sorghum, J. E. SASS. (Iowa State Col.). (*Iowa Acad. Sci. Proc., 43 (1936), p. 160*).—An abstract. The condition is reported to have been induced by ethyl mercury phosphate.

A simple method of inoculating wheat seedlings with paired monosporidial lines of Tilletia tritici and T. Levis, C. S. HOLTON. (U. S. D. A. and Wash. and Idaho Expt. Stas.). (*Phytopathology, 28 (1938), No. 7, pp. 518–520, fig. 1*).—This method is based on the principle that the secondary sporidia are ejected forcibly from the sterigmata. The monosporidial lines are grown on potato-dextrose agar in the same Petri dish. When mycelia and sporidia of the two lines have become intermingled and spread over the agar surface the dish is inverted and surface-disinfected seeds of a susceptible variety are placed on moist filter paper inside the cover. The dish is then incubated at 10° C. for 10–14 days, during which time the sporidia fall on the seedlings and expose them to infection. After incubation the seedlings are transplanted in a group to the greenhouse or field. Up to 57 percent infection has been obtained by this method, which has been used successfully in three tests.

Varietal susceptibility to common bean mosaic and transmission through seed, F. L. SMITH and W. B. HEWITT (*California Sta. Bul. 621 (1938), pp. 18, pls. 4*).—Seedlings of 118 selections from 51 varieties of common beans were inoculated in field plats and the harvested seeds planted at Berkeley and Davis, Calif. The results indicated a correlation between severity of symptoms and percentage of seed-borne mosaic from plants inoculated in the seedling stage. Dividing into five classes according to severity of symptoms, the average percentages of transfer at Berkeley were for mosaic classes 1–4, respectively, 6.8, 9.4, 20.3, and 36.1, while at Davis the values were 1.1, 20.8, 23.3, and 30.4 percent. The correlation coefficient between mosaic class and percentage of seed-borne mosaic was 0.640±0.054 at Berkeley, and 0.608±0.058 at Davis, apparently indicating that the degree of severity of symptoms in the respective arbitrary classes represents the relative susceptibility of the strains tested. If this is so, it then follows that the symptom expressions may be used to measure the susceptibility.

The mean daily temperatures during the growing months were 61°–62° F. at Berkeley and 70°–76° at Davis, but there was no apparent difference in the display of symptoms in the two localities.

A heritable abnormality of beans resembling mosaic, W. J. ZAUMEYER. (U. S. D. A.) (*Phytopathology, 28 (1938), No. 7, pp. 520–522*).—A leaf variegation, the symptoms of which somewhat resemble a virus disease, was observed in hybrid beans in which Corbett Refugee was used as either parent. This abnormality was shown to be heritable and not the result of virus infection. In the F_2 generation a ratio of 15 normal green to 1 variegated plant was obtained from 6,729 plants.

A preliminary note on the control of internal breakdown in table beets by the use of boron, G. J. RALEIGH and C. B. RAYMOND. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 526–529*).—Although no one of the minor element treatments used controlled internal break-down in beets grown in 8-in. pots in the greenhouse, the soils treated with borax produced fewer affected beets, and those showing symptoms were but slightly injured.

Boron deficiency of cauliflower and spinach on Long Island, J. D. HARTMAN. (Purdue Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 518–525, figs. 4*).—This study indicated an apparent boron deficiency in a number of Long Island, N. Y., soils, but it is not yet sufficiently serious to cause appreciable injury to cauliflower every year regardless of soil type and weather conditions. The injury was more severe in distinctly acid Sassafras silt loam than on the same type of soil at pH 6.0–7.1. The chief symptom in cauliflower is an internal brown spotting, with or without surface discoloration of the head and hollow stem.

Perithecial material of Erysiphe and Microsphaera on Trifolium pratense, G. A. PETERSEN. (Cornell Univ.). (*Mycologia, 30 (1938), No. 3, pp. 299–301, figs. 4*).—The author reports *E. polygoni* from two and *M. alni* from four stations at Ithaca, N. Y., the latter apparently a first report on red clover.

Some unrecorded hosts of Comandra pallida, a hemiparasite, T. E. BROOKS. (Kans. State Col.). (*Kans. Acad. Sci. Trans., 40 (1937), pp. 65, 66, fig. 1.*)—Eleven host species for this bastard toadflax are recorded, including six new host collections by the author (in Kansas) and notes on the host-parasite relations. The host range of other species of *Comandra* is also given.

Development of a differential inoculation technique for Diplodia stalk rot of corn, A. L. SMITH. P. E. HOPPE, and J. R. HOLBERT. (U.S. D. A., Wis. Expt. Sta., et al.). (*Phytopathology, 28 (1938), No. 7, pp. 497+504, figs. 4*).—The extent of stalk rot development in each of 13 dent corn single crosses after inoculation (method described) with *D. zeae* was compared with that from spontaneous infection in parallel series of uninoculated plants. The disease measurements in inoculated plants were pith spread and cortical spread, and in the uninoculated plants natural infection and broken stalks. The correlation coefficients obtained between these various measurements of disease were as follows: Pith spread and cortical spread, +0.948; natural infection and broken stalks, +0.909; pith spread and natural infection, +0.853; pith spread and broken stalks, +0.821; cortical spread and natural infection, +0.878; cortical spread and broken stalks, +0.899. It is concluded that relative resistance to this stalk rot can be measured by means of artificial inoculation, but problems are mentioned which need further study before this technic can be recommended for general practice.

Further studies of crinkle leaf, a disorder of cotton plants prevalent in Lintonia and Olivier silt loam soils of Louisiana, D. C. Neal and H. C. Lovett. (La. Expt. Sta. and U. S. D. A.). (*Phytopathology, 28 (1938), No. 8, pp. 582–587, figs. 2*).—Crinkle leaf is associated with high acidity, calcium deficiency, and manganese toxicity. Although readily corrected by calcium and other basic carbonates, it is not caused by a calcium deficiency per se. In pot and field tests, calcium supplied as $CaSO_4$ in amounts sufficient for nutritional requirements had no effect in controlling the disease. Very probably this was because the soil pH value in the pots thus treated remained essentially unchanged (pH 4.8 to 5), thus allowing manganese to remain in solution and cause the toxic effect described for crinkle leaf. On treating the soil with the basic carbonates—calcium, magnesium, and potassium—the manganese apparently was precipitated, and accordingly the plants remained healthy. The disease is attributable to manganese toxicity because soil from affected Louisiana areas has a consistently lower pH and contains significantly larger amounts of manganese than soil from healthy areas. The production of typical symptoms in sand cultures by addition of increasing amounts of $MnSO_4$ strengthens this viewpoint.

Control of Phymatotrichum (cotton or Texas) root rot in Arizona, R. B. Streets. (Coop. U. S. D. A.). (*Ariz. Agr. Col. Ext. Circ. 103 (1938), pp. [2]+80, figs. 30*).—This is a compendium of information on the physiology, life history, and pathogenicity of *P. omnivorum*, and on its control by rotation, clean fallow, and other cultural practices, resistant varieties, soil disinfection, fertilizers and soil amendments, and barriers. Root rot in virgin soil, selection of soil free from the fungus, and quarantine of infected areas are also discussed, and recommendations for its control on special crops are given.

Control of cotton wilt and "rust," or potash hunger, by the use of potash-containing fertilizers, V. H. Young (*Arkansas Sta. Bul. 358 (1938), pp. 26, fig. 1*).—In tests at 15 sites in central, eastern, and northeastern Arkansas where cotton wilt occurred, fertilizers containing potash in every year (1929–37) and in every location except 2 controlled rust and reduced the incidence of wilt (*Fusarium vasinfectum*). In general, the heavier potash applications were more efficient for wilt, but excessive amounts were without correspondingly greater results. Nitrate alone had little or no effect on wilt incidence, but nitrate with acid phosphate, and particularly the latter alone, seemed to increase the incidence of both troubles. Cottonseed meal was ineffective for either, but stable manure gave clear-cut control of rust and some decrease in wilt. There were some indications of cumulative effects both of potash deficiency and of potash applications on both troubles. Although potash alone gave at least as good results in wilt control as the same amount in a mixed fertilizer, the latter usually gave better yields. There were no cases where high potash resulted in increases of either disease over lower applications. Rust was associated with wilt at all the sites studied, except one where root knot was associated with severe wilt. A moderately wilt-resistant variety plus potash usually resulted in marked reductions of wilt incidence, but with root knot present both proved ineffective for wilt control. The high variation in potash effectiveness at different sites and the marked effect of weather on wilt attacks indicate that great differences in wilt control measures are to be expected. Field studies over a period of years in practically every locality where wilt is a factor appear necessary to determine the combinations of varieties and fertilizer which will give the best control for the cotton wilt-rust problem in any given locality. An explanation of the physiological basis for the observed facts is yet to come.

Breeding cucumbers for resistance to downy mildew, F. D. Cochran. (La. State Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 541–543*).—In crosses between the Indian variety Bangalore (resistant) and several slicing and pickling varieties, the F_1 generations proved to be intermediate between the parents for earliness, but the vigor and yield were always greater than for either parent. The fruit color was green, but slightly lighter than the commercial parents. The backcrosses and F_2 showed more variation for earliness than the F_1, and many segregations were as early as the commercial parents. The white fruit character was found to depend on a single recessive gene. A good fit to a 3 : 1 ratio was obtained in the F_2. The backcrosses to the green, black spine parents gave all green, black spine fruits. There was apparently no linkage between fruit and spine color, as a good fit to a 9 : 3 : 3 : 1 ratio was obtained from crosses of green, white spine × white, black spine. There appeared to be no linkage between resistance and fruit or spine color. The F_1 was more resistant than the commercial parents, while the F_2 showed segregation for resistance, and some plants showed as much resistance as the Indian parent. All highly resistant plants were selected for further study. There are apparently several factors involved in resistance or modifying factors present.

Stickiness and spotting of shelled green lima beans, C. Brooks and L. McColloch (*U. S. Dept. Agr., Tech. Bul. 625 (1938), pp. 24, figs. 16*).—The spotting developed on shelled green lima beans was found to be due to *Cladosporium herbarum* and the stickiness to bacteria, all spread to the beans during shelling. Three of the most active of the bacteria were *Pseudomonas ovalis* from Virginia beans, an organism probably identical with *Achromobacter coadunatum* from California beans, and one resembling *A. lipolyticum* from Florida beans.

Lowering the humidity in storage decreased both troubles but failed to give satisfactory control. A temperature of 50° F. did not always hold the troubles in check for 4 days, but 41° checked them for 6–7 days, and 32° for 10–14 days. Holding in an atmosphere containing 25 percent or more of CO_2 checked the development of stickiness equivalent to an 18° drop in temperature and was still more effective for spotting, with no deleterious effects on flavor. Washing the beans in a 30-percent solution of ethyl alcohol or the pods in a 4-percent solution of chlorinated lime gave complete control of spotting and good commercial control of stickiness.

Market-storage studies of honey dew melons and cantaloups, J. S. Wiant (*U. S. Dept. Agr., Tech. Bul. 613 (1938), pp. 19, pls. 6*).—The results of five storage tests (1931–33) indicated that honeydew melons, but not cantaloups, are subject to a low-temperature break-down occurring after 2 weeks' storage at 32°–34° F., and to a lesser extent at somewhat higher temperatures. Neither type of melon stored well above 40°–42° because of the rapid development of decay. A more detailed study was made (1934–36) of melons stored at 32°–34°, 36°–38°, and 40°–42° (with 38°–40° in a few tests), comprising eight tests with honeydew melons (84 flats) and six tests with cantaloups (63 crates). Again, low-temperature break-down occurred in the former but not in the latter, developing most abundantly at 32°–34°, to some extent at 36°–38°, but not at all at 38°–40° or 40°–42°. The disease is described and illustrated. *Cladosporium cucumerinum* was the most important decay organism found on stored melons of either type. It is also described and illustrated, and its relation to the break-down is discussed.

The results of the storage tests indicated that cantaloups removed from refrigerator cars can be held for a week or slightly longer at 32°–34°, while honeydew melons can be safely held for 2 weeks or longer at 32°–34° or 36°–38°, and with certain lots longer storage may be practicable. With both types of melons the riper ones decayed more readily in storage. Periodic examinations of stored melons are advocated.

Varietal reaction of pea to a virus from alsike clover, B. L. Wade and W. J. Zaumeyer. (U. S. D. A.). (*Phytopathology, 28 (1938), No. 7, pp. 505–511*).—Field studies were conducted (1935–36) to determine the varietal susceptibility and resistance of 145 varieties and strains of pea to alsike virus 1, the statistical constants being computed in a variance analysis. In both years, 24 strains showed complete freedom from the disease, while 7 were completely susceptible. Many of the resistant strains are of the Gem type or rather closely related to it. Although the survival value in 1935 was higher than in 1936, in general those varieties ranking high in 1935 also rated fairly high in 1936.

Some factors affecting the symptoms of the psyllid yellows disease of potatoes, L. A. Schaal. (U. S. D. A.), (*Amer. Potato Jour., 15 (1938), No. 7, pp. 193–206*).—These studies (Colorado, 1928–34) attempted to determine some causes of the symptoms of psyllid yellows due to the tomato psyllid *Paratrioza cockerelli*. Losses in yield (1929–34) were heavy in the early crop districts, the appearance of the disease being coincident with the appearance of the psyllid. Certain varieties appeared more resistant. Greatest injury occurred in seasons of high temperatures and low humidity, and symptom expressions were accentuated by sunlight and high air temperatures. Direct sunlight was necessary to the expression of typical color symptoms. When a psyllid nymph extract was introduced into healthy potato plants in certain concentrations, symptoms like those in the field were induced. The disease was not tuber-transmitted, but there was a general weakening of plants from affected tubers. Typical symptoms were induced when 25 or more nymphs were placed on single-stem potato plants, the severity of the symptoms increasing with numbers up to 100 per plant. Plants in a highly alkaline soil, those infected with fungus diseases, and those with injured stems and root systems developed the yellows symptoms with relatively fewer insects than those growing under more favorable conditions.

Spraying with cold water under pressure twice daily for 14 days gave practically complete control. Workers at the Colorado Experiment Station found that lime-sulfur (1–40), applied under 300–400-lb. pressure, gave good control (E. S. R., 71, p. 221).

Tolerance of certain potato varieties to psyllid yellows, M. F. Babb and J. E. Kraus. (U. S. D. A.). (*Nebr. State Bd. Agr. Ann. Rpt., 1937, pp. 694–698*).—Data (1 yr.) were obtained on the relative tolerance of 39 varieties of potato. No variety proved immune, but it appeared reasonably certain that there are differences in tolerance among the varieties. Tabulations are given for the relation between yield, earliness, and psyllid injury, the average yield of varieties grouped according to earliness, and the ratio of yield of United States commercial grade to culls in the varieties tested.

The silver-scurf disease of potatoes, O. D. Burke (*[New York] Cornell Sta. Bul. 692 (1938), pp. 30, figs. 5*).—Potatoes are said to be probably the only plants susceptible to the *Spondylocladium atrovirens* silver scurf disease. It is only the tubers that are affected, and inoculations and field counts indicate that they become susceptible at or near maturity in the soil and remain so during storage. Varietal differences are noted. Invasion is confined to the phellem layers, the fungus being capable of loosening the suberized cells from which it takes its nourishment, causing them to slough off. Cultural studies have indicated the effects of humidity and temperature on growth rate to parallel similar conditions on the tubers. The fungus grows over a wide pH range. During storage, lesion inception and enlargement were inhibited below 90 percent humidity and 37° F. Seed treatments have not proved entirely satisfactory, but malachite green and a mercuric chloride-mercuric cyanide mixture have shown some promise. Yellow oxide of mercury soil treatment may prove of value as a field preventative. There are also indications that the disease may be controlled by prompt digging at maturity.

Potato spraying experiments in Louisiana during 1936–1937, M. A. Petty, Jr. (Univ. Minn.). (*Amer. Potato Jour., 15 (1938), No. 7, pp. 188–191, figs. 3*).—The results of this investigation (1936–37) appear to indicate that spraying of potatoes in Louisiana is profitable only in certain years. When early blight appeared about 1 mo. before digging, spraying was profitable, 3–5 applications of bordeaux with or without Wyo-jel giving the greatest increases in yield. When early blight was not a factor, spraying proved unprofitable. The need for extensive spray tests over a period of years is indicated.

Factors influencing the pathogenicity of Pythium de baryanum on sugar beet seedlings, W. F. Buchholtz. (Iowa Expt. Sta.). (*Phytopathology, 28 (1938), No. 7, pp. 448–475, figs. 7*).—Damping-off induces sugar beet stand failures in northern Iowa on acid soils (below pH 6.5) at moderately high soil temperatures (above 15° C.). *P. debaryanum* caused over 95 percent of the field damage to germinating, emerged, and post-emerged seedlings. Seed-borne *Phoma betae* acted slowly and was observed on and isolated from seedlings from infected seed in steamed and field soils when *Pythium* was relatively inactive. *Rhizoctonia* was isolated rarely from field-grown seedlings. Temperatures below 15° were unfavorable both to the growth of *P. debaryanum* in pure culture and to its pathogenicity to sugar beet seedlings. Two pathogenic cultures grew uniformly well at pH 4.7–7.3. In field tests (1933–35), early planting increased emergence and survival, seed treatment (5 percent ethyl mercuric phosphate, used 4–7 oz. per 100 lb. seed) increased emergence and survival and was most effective in early plantings, and liming increased emergence only slightly but increased the survival percentage.

Rot of mature tap root of sugar beet caused by Pythium butleri, W. A. Kreutzer and L. W. Durrell. (Colo. Expt. Sta.). (*Phytopathology, 28 (1938), No. 7, pp. 512–515, figs. 2*).—In the late summer of 1936 a peculiar root malady of sugar beets was observed in a large field in the Rocky Ford, Colo., district. Platings from the interior of rotting roots yielded a fungus identified as *P. butleri*. Besides attacking the mature beet roots, it was found capable of causing a severe damping-off of the seedlings. A histological examination of affected, mature root tissue showed the hyphae in profusion in all parenchymatous tissues and also in the vessels.

Paradichlorbenzene as a control for blue mold disease of tobacco, E. E. Clayton. (U. S. D. A.). (*Science, 88 (1938), No. 2272, p. 56*).—Tests here reported appear to indicate that paradichlorobenzene as a substitute for liquid benzol may be a distinct advance toward making the gas treatment simpler to use, and hence more practical for the suppression of downy mildew in the seedling tobacco beds.

Control of downy mildew achieved in New England, P. J. Anderson. (Conn. [New Haven] Expt. Sta.). (*Tobacco, 106 (1938), No. 26, pp. 12–14, figs. 5*).—The author reports the successful use of the benzol and paradichlorobenzene methods of control for tobacco blue mold or downy mildew under Connecticut conditions.

Particle size of tobacco mosaic virus, C. H. Hills and C. G. Vinson (*Missouri Sta. Res. Bul. 286 (1938), pp. 18, figs. 2*).—With the standardized diffusion cell and formulas used, the radius of the virus particle of tobacco mosaic virus 1 in solution at ±pH 5.0 was found to be 4.09±0.31 mμ. The apparent radius of the virus in the presence of trypsin, at the relative concentrations used, was 17.40±1.59, this increase in size probably being due to adsorption of trypsin by the virus particle. With the relative concentrations used, the diffusion rate of trypsin in solution, free from active virus particles, was 33.6 percent greater than when virus particles were present, also indicating adsorption reactions. The isoelectric point of the protein in highly purified virus preparations from three plant species was pH 3.6±0.1.

Tobacco wildfire (*Pennsylvania Sta. Bul. 360* (*1938*), *p. 34*).—A note on studies of this disease by the station.

Acquired tolerance to curly top in the tomato, J. W. Lesley and J. M. Wallace. (Calif. Citrus Expt. Sta. and U. S. D. A.). (*Phytopathology, 28* (*1938*), *No. 8, pp. 548–553, fig. 1*).—Plants severely affected by this virus sometimes recover and acquire a tolerance to it. New, relatively healthy growth arises from the leaf axils, and frequently such plants produce a fair crop of tomatoes. The proportion recovering varies with the season and the race. In one wild race, 55–100 percent of the plants recovered in different years. Clones derived from recovered plants of certain races usually showed no visible effects when reinoculated, whereas clones from healthy, noninoculated plants became severely diseased. The virus, apparently unchanged in virulence, was readily obtained from recovered plants. Clones from the same recovered plant often vary considerably in growth rate, symptom expression, and fruit yield. Some of the recovered plants may show a relapse, apparently without additional inoculation.

Tomato leaf mold as influenced by environment, E. F. Guba (*Massachusetts Sta. Bul. 350* (*1938*), *pp. 24, figs. 7*).—The author reviews the work of others and reports the results of tests indicating that in Massachusetts favorable conditions for infection commonly occur in the greenhouse which are often beyond reasonable or practical means to counteract by artificial heat or natural or forced ventilation and which argue for continued effort to develop resistant varieties.

Leaf mold is usually epidemic indoors from June to October in eastern Massachusetts. The spores withstand severe winters and remain viable under most adverse conditions for 9–12 mo. The best spore germination occurred at 100 percent relative humidity and 75°–78° F. Germination failed below 95–96 percent relative humidity or 40° and above 94°. Although 115°–116° for 2 hr. killed the conidia, they germinated readily on plants exposed 3 hr. to 118°–123°, which injured the plants. Strong light killed the spores. Infection occurs through stomata, usually underneath the leaves where light, temperature, and air humidity are most favorable. Closure of stomata due to moisture deficiency in the leaves or to darkness hinders infection.

There are 42 literature citations.

Pythium irregulare and damping off of watermelons, S. G. Younkin. (Iowa Expt. Sta.). (*Phytopathology, 28* (*1938*), *No. 8, p. 596*).—*P. irregulare* (15 isolations) caused seed decay, preemergence damping-off, and root necrosis of seedlings, regardless of their resistance or susceptibility to *Fusarium bulbigenum niveum*. The evidence indicated that field losses of seedlings are not entirely attributable to the *Fusarium* but that *P. irregulare* may be responsible for a portion of the damage.

The histology of bitter pit in apples, R. M. Smock and A. Van Doren. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 34* (*1937*), *pp. 176–179, figs. 3*).—This is a summary of the results of a histological study of the development of bitter pit. Pits developed on the tree v. in storage, and pitted areas in four varieties, had the same general characters.

Studies of black root rot of apple, F. D. Fromme and F. J. Schneiderhan. (W. Va. Expt. Sta.). (*Phytopathology, 28* (*1938*), *No. 7, pp. 483–490, figs. 3*).—After 2–3 yr., 100 of 165 young trees set in soil where apple trees had died of black root rot had become infected by *Xylaria mali*. Certain individuals exhibited as many as 10 separate lesions, and some of the crowns were completely invaded. No promising measure of resistance was exhibited by any one of the 45 clons of *Malus* spp. included in the plantings or by any one of 12 clonal and 11 seedling stocks inoculated with *X. mali* in pure culture.

Further investigations on the use of boron for control of internal cork of apples, E. S. Degman, L. P. Batjer, L. O. Regiembal, and J. R. Magness. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 165–168*).—Continuing these studies (E. S. R., 78, p. 505), it was evident from the orchard tests described that boron (boric acid or borax) applied to the soil in late fall or early spring was fully effective in controlling internal cork. The trouble appears to be due either directly or indirectly to a deficiency of boron in the soil. General observations seemed to indicate that when coupled with boron deficiency, it is more prevalent in dry years or years of irregular rainfall.

Control of internal cork of apple with boron, A. B. Burrell. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 169–175, figs. 3*).—Injection of boric acid or soil application of borax each reduced the amount of internal cork by over 99 percent in the only orchard where symptoms were general (1937). No foliage injury has yet resulted from conservative soil applications or injection with proper precautions. Such injury from excess boron is distinctive and the symptoms are described. Foliage injury from borax sprays was lessened by the presence of lime or lime-sulfur, and developing leaves appeared more susceptible than mature ones. Injury to the bark around injection holes appeared more severe when treatments occurred about September 1 than when late in May. Soil applications are preferred over the injection treatments.

Development of storage scab in apples, E. A. Walker. (Univ. Md.). (*Md. State Hort. Soc. Proc., 40 (1938), pp. 61–63*).—A general discussion of the factors influencing scab development in storage and its control.

The comparative importance of leaves and twigs as overwintering infection sources of the pear leaf-blight pathogen, Fabraea maculata, M. C. Goldsworthy and M. A. Smith. (U. S. D. A.). (*Phytopathology, 28 (1938), No. 8, pp. 574–582*).—In Maryland and Missouri the fungus was found to depend almost entirely on bark infections for the completion of its life cycle. It overwintered principally as mycelium in the bark tissues of 1-year-old wood rather than in the diseased leaves overwintering on the orchard ground. The asco stage was never found on diseased pear leaves, and the conidial stage overwintered sparsely, under favorable conditions, in leaves and in old bark cankers Conidia were found not to overwinter in diseased fruits. Conidia produced in the spring were disseminated from the cankers over several months. Those escaping from leaf lesions may cause infections on young bark at any time during the growing season.

The bibliography includes 51 references.

Black-end of pears v. seasonal changes in pH of the fruit, L. D. Davis and N. P. Moore. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 393–401, figs. 6*).—Continuing this series (E. S. R., 76, p. 495), the data presented indicate that each section of the Bartlett pear fruit exhibits the same type of curve for seasonal changes in pH, but the rate of change in active acidity differs for each section. The calyx end changes over a greater range of pH than either of the other two sections. In very young fruit the calyx end is much more alkaline than either of the other two, and the stem end is more alkaline than the midsection. In fruits of picking maturity the calyx end is less alkaline than the stem end and nearly equal to the midsection in pH. Because of the different rate of acidity change in the three sections, the calyx end and midsection become nearly alike, the midsection and stem end become more divergent, and the calyx and stem end change their relative positions during the fruit development.

Comparison of the pH of fruits from black-end v. normal trees indicates that the former seem to be consistently more alkaline throughout the season, but that they do not become markedly so until just before the rapid increase in number of black-end fruits. The close relationship in time between the appearance of black end and the occurrence of significant changes between the two groups of fruits suggests an intimate association between these two phenomena occurring prior to the time the disease becomes visible.

Control of cherry leaf-spot in West Virginia, F. J. Schneiderhan (*West Virginia Sta. Bul. 288 (1938), pp. 18, figs. 5*).—Uncontrolled leaf spot, said to be the most important cherry disease in the State, causes defoliation, reduced yields, and devitalization of the trees predisposing to winter injury. The fungus *Coccomyces hiemalis* overwinters in dead leaves producing the ascospores about blossom time, and causing early infection. The conidia are formed in the leaf lesions and cause infection and spread of the disease later in the season, though both types may be concurrent. Records of ascospore discharge indicated that infection is possible before the petal-fall spray, which is the first hitherto used locally. According to two years' tests a preblossom spray is indicated to be as valuable in preventing spring infections as the petal-fall spray, while the post-harvest spray is relatively the most important in forestalling late infection and heavy carry-over of the fungus. The heaviest leaf-spot infection (1934–37) appeared in August and September, pointing to the necessity of the post-harvest treatment.

Blister rust susceptibility studies of naturally pollinated seedlings of the immune Viking currant, G. G. Hahn. (U. S. D. A.). (*Jour. Forestry, 36 (1938), No. 8, pp. 737–747, figs. 3*).—Though currants and gooseberries are known to be susceptible in general to *Cronartia ribicola* infection, two red currant garden varieties have been extensively studied and proved to be immune. In Germany, the Rote Holländische variety has been immune over a period of 5 yr. For a longer period (1928–37) the author has demonstrated the related variety Viking to be also immune in Europe and North America. Its seedlings, propagated from seed collected from spontaneously pollinated bushes growing both where the possibility of cross-pollination with susceptibles was not excluded and also where it seemed unlikely, produced a high percentage of rust-immune plants, and a relatively small percentage of susceptibles the majority of which were weaklings. Among those with vigorous growth two proved highly susceptible, whereas the remainder were highly resistant. From the results obtained it is believed probable that a very small percentage of the seedlings are heterozygous, whereas the majority of the Viking seedlings must be homozygous, rust-resistance being a dominant character in the parent. The evidence indicates further that there may be multiple factors involved in the resistance inheritance. The parentage of Viking is discussed, together with inheritance of rust resistance in the variety and the possibilities of its inbreeding with other currants.

Frost injury to raspberry flower buds, L. Havis (*Ohio Sta. Bimo. Bul. 193 (1938), pp. 139–141, figs. 2*).—Injury by a late spring frost to red and black raspberry flower buds is reported, the greater damage being to the latter and to the earlier varieties. The most common type of injury was the killing of both pistil and stamens.

Isolation of the fungus causing the red stele or red core disease of strawberries, H. F. Bain and J. B. Demaree. (U. S. D. A.). (*Science, 88 (1938), No. 2276, pp. 151, 152*).—This note discusses briefly the history and pathogenesis of the disease, and reports isolation of the causal *Phytophthora* (species undetermined), proof of its pathogenicity, and some comments on its cultural behavior.

Observations on the resistance of grape varieties to black rot and downy mildew, J. B. Demaree, I. W. Dix, and C. A. Magoon. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 451–460*).—Observations on 270 American euvitis and European vinifera varieties at Arlington Experiment Farm. Va., (1937), led to their segregation into five groups on the basis of their relative resistance to these diseases: (1) 27 varieties showed marked resistance to both, (2) 17 displayed notable resistance to downy mildew but high susceptibility to black rot, (3) 63 were highly resistant to black rot, but highly susceptible to mildew, (4) 127 showed medium to low resistance to both diseases, and (5) 36 vinifera varieties exhibited high susceptibility to these diseases. *Vitis riparia, V. aestivalis, V. lincecomii,* and *V. labrusca* species appeared to be the most likely sources of desirable material for use in developing disease-resistant grapes.

Experiments on the treatment of mottle-leaf of citrus trees, IV, E. R. Parker. (Calif. Citrus Expt. Sta. et al.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 217–226*).—Continuing this series (E. S. R., 78, p. 359), the results reported are said to indicate duration of response to be a satisfactory criterion of the relative values of zinc treatments. The efficiency of sprays containing very low concentrations of zinc materials appeared greatest when application was made prior to the spring or fall growth cycles. Spreader proved of value in very dilute suspensions of insoluble zinc materials, but not in similarly dilute solutions of $ZnSO_4$. Increasing the concentration of the spray to a zinc equivalent of about 1.15 lb. per 100 gal. was found to be more important than any of these factors, but increases in concentration above that point produced no additional response. The season or rate of application appeared to have no practical effect on duration of response. Suitable zinc sprays were effective in controlling mottle-leaf for 2–4 yr. on trees previously seriously affected. Equally good results were obtained with metallic zinc dust, zinc oxide, crude zinc oxide, precipitated zinc carbonate and sulfide, and zinc sulfate used with three precipitating agents—lime-sulfur, hydrated lime, and soda ash. Smelter zinc sulfide sprays induced only transient improvement. Finely divided metallic zinc and various relatively insoluble zinc compounds in dusts diluted to 10 percent zinc content proved less effective than equal amounts in sprays.

Progress in mottle leaf control, I, II, E. R. Parker. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 23 (1938), Nos. 8, pp. 334, 367, fig. 1; 9, pp. 392, 393*).—Experiments and observations are said to indicate that citrus trees will respond to treatment in proportion to the severity of symptoms. Zinc-containing sprays have proved to be the most effective treatment, zinc sulfate and oxide apparently being the most practical and economical sources. For safety the sulfate must be combined with a precipitating chemical, hydrated lime or soda ash apparently proving suitable. Spreaders do not appear to be necessary. Certain combination sprays, such as lime-sulfur and zinc oxide, have seemed feasible. There is little doubt that oils are affected by such combination, and if so used the specific recommendations of the manufacturer of the oil should be followed.

Experiments on navel water spot, W. Ebeling, L. J. Klotz, and E. R. Parker. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 23 (1938), No. 10, pp. 410, 434–436, figs. 3*).—The results of the two experiments described substantiate several years of field observations on the possible severity of water spot on navel oranges and the role of oil sprays as a contributing factor in favoring its occurrence. A comparatively small amount of the trouble occurred with the miscible oil used with lime-sulfur. The limiting factor with this spray is the injury which might result to both tree and fruit under unfavorable weather conditions, especially hot, dry north winds following treatment. Similar results were obtained with ammonium polysulfide substituted for the lime-sulfur. All fumigated plats were nearly free of water spot. The supplemental wax emulsion (2 percent concentration) had considerable value, but it is deemed questionable whether its use would be warranted except in very severe cases of water spot and when oranges have a high market value.

Two new species of Omphalia which cause decline disease in date palms, D. E. Bliss. (Calif. Citrus Expt. Sta.). (*Mycologia, 30 (1938), No. 3, pp. 313–326, figs. 10*).—Two basidiomycetous fungi previously reported (E. S. R., 78, p. 808) as involved in the etiology of decline disease of date palms are here diagnosed and described as *O. pigmentata* and *O. tralucida* n. spp. These fungi do not commonly fruit in the open, but sporulation was induced on inoculated seedlings of *Washingtonia filifera* in the greenhouse. Soil and air temperatures of 26°–31° C. and a relative air humidity of 92–98 percent favored sporophore development.

Results of three years spraying with low lime bordeaux mixture for the control of pecan scab, J. R. Cole and J. R. Large. (U. S. D. A.). (*Peanut Jour. and Nut. World, 17 (1938), No. 6, pp. 26, 27*).—The results reported are said to indicate that one prepollination spray application of bordeaux mixture (2–0.5–50) soon after foliation begins, followed by three applications (3–1–50) at intervals of 3–4 weeks, will control *Cladosporium effusum* infection. The importance of sanitary measures is also stressed. A correlation was found between infection and rainfall, the greatest infection occurring during periods of heaviest rainfall, especially when the rains occur in the late afternoon or evening. Spray equipment and the preparation of bordeaux mixture are discussed.

A Fusarium following frost-injury of Robinia, J. C. Gilman and B. B. Sproat. (Iowa Expt. Sta.). (*Iowa Acad. Sci. Proc., 43 (1936), pp. 101–106, figs. 4*).—The evidence presented appears to indicate that the primary cankers observed on seedlings of *R. pseudoacacia* were caused by frost injury, followed by invasion of the injured tissue by *F. sarcochroum.*

A preliminary report on frenching of tung trees, W. Reuther and R. D. Dickey. (Fla. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), p. 230*).—The disorder is not confined to any soil series or narrow range of pH, but is possibly correlated with exchangeable manganese in the soil. It was controlled by $MnSO_4$ as a foliage spray or soil amendment.

Sprays control blight on walnuts, P. W. Miller. (U. S. D. A.). (*Better Fruit, 32 (1938), No. 12, pp. 14, 15*).—The results of the tests reported appeared to indicate that three applications of bordeaux mixture made, respectively, in the early prebloom, late prebloom, and early postbloom stages were needed under most conditions to reduce the incidence of infection to a negligible amount. The set of nuts was not reduced by the spray treatments, but the 2–2–50 mixture induced injury when applied to young leaves. The severity of foliage injury diminished with decreasing amounts of lime to where the neutral point was reached. Thorough and timely spraying is reported to have given satisfactory control in commercial orchards.

Where are gardenia cankers initiated? P. P. Pirone. (N. J. Expt. Stas.). (*Phytopathology, 28 (1938), No. 8, pp. 597, 598, fig. 1*).—A large percentage of cankers due to *Phomopsis gardeniae* started at the nodes on the base of the cuttings after they had been set in the rooting medium. The practice among growers is to remove the lower leaves with a knife before embedding the cuttings.

These freshly cut surfaces furnish an excellent point of entrance and are important foci for later infection.

The Cercospora leaf spot of rose caused by Mycosphaerella rosicola, B. H. Davis. (Cornell Univ.). (*Mycologia, 30 (1938), No. 3, pp. 282–298, figs. 7*).—The ascigerous stage *M. rosicola* n. comb. is connected with the previously known conidial stage *Cercospora rosicola.* The pathogenicity was proved by inoculations, the known suscepts are listed, and the range, importance, and symptoms of this rose disease are given. A comparative study of the Cercosporas reported in the literature for the rose appear to indicate that there are but three, viz, *C. rosae*, *C. rosicola*, and *C. hyalina.* A fourth, collected in the southern United States and here described as new, is *C. puderii.*

The antithetic virus theory of tulip-breaking, F. P. McWhorter. (Oreg. Expt. Sta. and U. S. D. A.). (*Ann. Appl. Biol., 25 (1938), No. 2, pp. 254–270, pls. 2*).—The term "antithetic" is suggested for viruses which are usually associated and which are physiologically antagonistic. Tulip breaking results from the interaction of tulip virus 1 which inhibits flower and leaf color and tulip virus 2 which adds flower color but has no visible effect on chlorophyll distribution. The established commercial broken tulips contain physiologically balanced mixtures of these two viruses.

Germination of seeds and damping-off and growth of seedlings of ornamental plants as affected by soil treatments, W. L. Doran (*Massachusetts Sta. Bul. 351 (1938), pp. 44, figs. 2*).—Since damping-off is a principal problem in propagation from seed, the search for better, safer, and less expensive fungicides continues, and this bulletin, which includes also some reference to the work of others (with 103 literature references), presents a summary of studies in which 112 species of ornamentals were involved. Damping-off is not altogether controllable by environal regulation, since conditions favorable to the fungi are too nearly those preferred by the hosts. In washed sand, sand-sphagnum, or sand-peat moss there was very little damping-off as compared with soil, but growth of all species was poorer in sand, even with added nutrients, than in soil, and usually better in sand-sphagnum or sand-peat moss (with nutrient) than in sand. In sterilized soil diluted with washed sand, seedling growth was satisfactory, and there was no increase in damping-off. The study indicated that a soil treatment proving good for one plant species may not be so good, or may even be injurious, to another. Damping-off was not controlled by calcium sulfate, acetate, or chloride, or by materially raising the pH with hydrated lime. It was controlled by calcium cyanamide, and more use of this treatment is suggested when the necessary delay between soil application and seeding is not objectionable. Ammonium hydroxide also prevented the disease, and, as used, was harmless to most species. The time interval between soil treatment and seeding depended partly on the species involved, and formic and acetic acids and formaldehyde were, in general, less injurious to slowly than to rapidly germinating seeds. Quantities of volatile chemicals which were safe enough if worked into the soil immediately before seeding were injurious if applied to the surface immediately after seeding, since they were then more concentrated near the seeds. Detailed data with respect to the effects of a large number of chemicals on control and on the hosts themselves are presented for the plants under study.

A new microcyclic Coleosporium on limber and pinon pines, G. B. Cummins. (Ind. Expt. Sta.). (*Phytopathology, 28 (1938), No. 7, pp. 522, 523, fig. 1*).—*C. crowellii* n. sp., producing amphigenous orange telial horns, composed of chains of teliospores which germinate with an internal basidium, is described and reported on *Pinus flexilis* (type) and *P. edulis.*

The conidial stage of Hypoxylon pruinatum, N. V. Ponomareff. (Minn. Expt. Sta.). (*Phytopathology, 28 (1938), No. 7, pp 515–518, figs. 2*).—Conidial fructifications of the *H. pruinatum* causing a destructive disease of forest poplars are formed beneath the bark epidermis on young cankers. On cankers from artificial inoculation they first appeared about 3 mo. after infection. The mature conidial stromata averaged 0.85 mm in width at the base and 1.5 mm in length, tapering from base to apex. The entire surface of each stroma, except for the tips of those pressing against the epidermis and finally causing it to fall off, is covered with branched conidiophores 75μ–150μ long. Each branch at first bears a single, terminal spore, but later the ends of the branches become geniculate. The conidia are hyaline, unicellular, fusiform to elliptical, and 2μ × 5.5μ to 3μ × 6.7μ in size. Agar cultures of these conidia are similar to those from ascospores of *H. pruinatum.*

ECONOMIC ZOOLOGY—ENTOMOLOGY

Wildlife Review, [May and July 1938] (*U. S. Dept. Agr., Bur. Biol. Survey, Wildlife Rev. Nos. 14 (1938), pp. 33; 15, pp. 44*).—A continuation of this series (E. S. R., 79, p. 71).

Studies on rodent populations in a forested area, D. M. Hatfield. (Minn. Expt. Sta.). (*Jour. Mammal., 19 (1938), No. 2, pp. 207–211, figs. 2*).—A report is made on the trapping of rodents in the latter half of the summer of 1937 at the Lake Itasca Forestry and Biological Station of the University of Minnesota.

Life history notes on the northern pine mouse, W. J. Hamilton, Jr. (Cornell Univ.). (*Jour. Mammal., 19 (1938), No. 2, pp 163–170, figs. 3*).—Observations made of the northern pine mouse (*Pitymys pinetorum scalopsoides*) in the past few years are here recorded.

The food habits of the little owl (Carine noctua Vidalii), A. Hibbert-Ware (*Ann. Appl. Biol., 25 (1938), No. 1, pp. 218–220*).—The normal diet of the little owl was found to consist of invertebrates and small mammals. During the nesting season, from May to July, larger mammals and birds are added in large enough numbers to be included as part of the regular diet, though not to the exclusion of the other items. It has a regular diet common to all districts and seasons, feeds chiefly on ground fauna, and is largely crepuscular and nocturnal in its habits.

The rook in the rural economy of the Midlands, A. Roebuck (*Ann. Appl. Biol., 25 (1938), No. 1, pp. 215–218*).—A practical discussion of the rook (*Corvus frugilegus frugilegus*), with special reference to its number, distribution, and feeding habits, based upon surveys in the Midlands of England. The findings indicate that its damage is limited largely to the vicinity of the rookery.

The warblers of New Jersey.—I, Summer resident warblers, L. A. Hausman (*New Jersey Stas. Bul. 646 (1938), pp. 48, figs. 21*).—This, the tenth in the series of bulletins (E. S. R., 77, p. 212) treating of the birds of New Jersey, deals with one section of the great group of wood warblers (family Compsothlypidae), the 23 summer residents or breeding forms of which spend their winters south of the State. A brief description of the adult male and female and a discussion of the dietary, habitat, nest, song, and range within the State are given for most of the several forms.

Reptiles of Arkansas, H. H. Schwardt (*Arkansas Sta. Bul. 357 (1938), pp. 47, figs. 53*).—Following an introductory account which includes a brief discussion of the economic importance of reptiles, the snakes, 45 species of which are found in Arkansas (pp. 6–35), the lizards, 11 species of which occur in the State, 3 abundantly (pp. 35–40), and the turtles, of which 7 of the 20 species listed were observed by the author (pp. 40–45), are considered, their distribution being indicated. An illustrated key for the identification of the snakes and a key for the identification of the lizards are given, as is a list of 22 references to the literature.

[Notes on economic insects and their control] (*Jour. Econ. Ent., 31 (1938), No. 4, pp. 544–547, figs. 2*).—The contributions presented (E. S. R., 79, p. 649) are: A Cage for Rearing the Cheese Skipper (*Piophila casei* L.), by H. A. Crandell (pp. 544, 545) (Ohio State Univ.); The Furniture Beetle *Anobium punctatum* DeG. in Washington [State], by M. H. Hatch (p. 545); Discussion of the Term "Derris Resinate," by R. C. Roark (p. 545), as used by La Due (E. S. R., 79, p. 502), and Sulfur Nitride as a Possible Insecticide and Fungicide, by R. A. Fulton (pp. 545, 546) (both U. S. D. A.); Variation in the Susceptibility of Brambles to the Red-Necked Cane Borer (*Agrilus ruficollis* (F.)) (p. 546) and *Paratrioza cockerelli* (Sulc.) in Oklahoma, both by E. Hixson (p. 546) (both Okla. A. and M. Col.); The Common Red Spider and Carnation Rust, by D. Asquith (pp. 546, 547) (Mass. State Col.); *Tarsonemus* spp. Attacking Mushrooms, by A. C. Davis (p. 547) (U. S. D. A.); and Notes on Wettable Sulfurs, by S. W. Frost (p. 547) (Pa. Expt. Sta.).

[Work in entomology by the Idaho Station], C. Wakeland. (Partly coop. U. S. D. A.). (*Idaho Sta. Bul. 225 (1938), pp. 44–48, figs. 2*).—The work of the year reported upon (E. S. R., 77, p. 813) relates to insect control; cooperative tests of sprays for control of the beet leafhopper; the use of sprays and dusts for *Lygus* insect control; pea weevil control through the use of trap crops, rotenone-bearing dusts, and the burial of weevil-infested peas; codling moth control; the control of insects by parasites; and miscellaneous investigations, including spider mites (*Tetranychus pacificus*) and the sugar beet wireworm.

[The sixth and seventh annual insect population summaries of Kansas, covering the years 1936 and 1937], R. C. Smith and E. G. Kelly. (Kans. Expt. Sta.). (*Jour. Kans. Ent. Soc., 10 (1937), No. 4, pp. 113–132, fig. 1; 11 (1938), No. 2, pp. 54–76, fig. 1*).—The annual summaries (E. S. R., 78, p. 659).

[Work in entomology by the North Carolina Station] (*North Carolina Sta. Rpts. 1936, pp. 38–40, 68–70, figs. 4; 1937, pp. 50, 57–59, 62, 63*).—The work of the year 1936, briefly referred to, relates to the peanut leafhopper, by Z. P. Metcalf; and the corn earworm (E. S. R., 78, p. 219), the harlequin bug, and the melon and pickle worm, all by B. B. Fulton. That for 1937 relates to the protection of stored corn from the rice weevil, corn earworm control on sweet corn, pickle and melon worms, harlequin cabbage bug, and cabbage maggot, all by Fulton; and the peanut leafhopper, by Metcalf.

[Cotton insect investigations by the Georgia Coastal Plain Station] (*Georgia Coastal Plain Sta. Bul. 28 [1937], pp. 10, 72*).—The work of the year with cotton insects, particularly the bollweevil, to which sea island cotton was found particularly susceptible, is noted.

Insects found in the milling streams of flour mills in the southwestern milling area, N. E. Good (*Jour. Kans. Ent. Soc., 10 (1937), No. 4, pp. 135–148, figs. 6*).—The relative abundance and frequency of occurrence of the six leading groups found in the millstreams of flour mills, the geographical distribution, the insect populations in the different millstreams, and the seasonal fluctuations in populations are considered, the details being given in tables and graphs.

[Blueberry insects], E. P. Darlington (*Jour. N. Y. Ent. Soc., 46 (1938), No. 2, pp. 229, 230*).—Brief reference is made to the more important enemies of the blueberry observed at New Lisbon, N. J.

[Contributions on citrus insects] (*Fla. State Hort. Soc. Proc., 50 (1937), pp. 95–111, pls. 3*).—The following contributions relating to insects affecting citrus in Florida were presented at the annual meeting of the Florida State Horticultural Society held at Ocala, Fla., in April 1937: Spray Combinations for Use on Citrus Trees in Florida, by W. W. Yothers (pp. 95–98); The Control of Scale Insects on Citrus, by R. L. Miller (pp. 100–106); and Early and Late Injury of [Citrus] Rust Mites on Oranges, by W. L. Thompson (pp. 107–110) (Fla. Citrus Expt. Sta.).

Control of thrips and aphids in citrus groves, J. R. WATSON. (Fla. Expt Sta.). (*Citrus Indus., 19 (1938), No. 1, pp. 12–14*).

Potato spraying experiments in North Dakota, J. A. MUNRO and L. A. SCHIFINO. (N. Dak. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 4, pp. 485–487*).—This is a preliminary report of work directed toward the formulation of a satisfactory and efficient spraying program for potatoes in North Dakota.

New facts concerning cryolite spray residues, S. MARCOVITCH and W. W. STANLEY. (Tenn. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 4, pp. 480–482*).—The data here presented have led the authors to conclude that cryolite is a material that is reasonably safe to human health, an effective insecticide, harmless to foliage, and economical in cost.

Nicotine thiocyanate, a contact insecticide, J. S. MCHARGUE and R. K CALFEE. (Ky. Expt. Sta.). (*Indus. and Engin. Chem., 29 (1937), No. 11, pp. 1232, 1233*).—Nicotine thiocyanate, prepared by decomposition of ammonium thiocyanate, was found to be a very effective aphicide. When applied in sufficient concentration with a suitable spreader, it controlled the common red spider. The compound is decomposed by the more positive ions in solution, losing much of its effectiveness, and is then capable of serious foliage injury. A table is given showing the effect of spreaders with nicotine thiocyanate on the common red spider.

Soybean flour as a spray material, M. D. FARRAR and W. P. FLINT. (Ill. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 4, pp. 482–485*).—This contribution includes tables giving the composition of average soybean flours of the whole bean, expeller, and solvent types and field experiments on the Red Delicious apple conducted in southern Illinois in 1937 in which soybean flour was used as a sticker and spreader.

Service of paint on woods treated with termite repellents, M. RANDALL and T. C. DOODY. (Univ. Calif.). (*Indus. and Engin. Chem., 30 (1938), No. 4, pp. 444–449, figs. 4*).—Reconnaissance experiments on the service of paints with typical western woods—Douglas fir, redwoods, and ponderosa pine—treated with termite repellents are reported, the details being given in tables and charts.

Differential feeding of grasshoppers on corn and sorghums, A. M. BRUNSON and R. H. PAINTER. (Kans. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 4, pp. 334–346, figs. 4*).—The authors report upon observations made during the grasshopper outbreak of 1936, in which outstanding instances of differential injury among corn varieties, top crosses, and hybrids were noted. "In one series of 52 hybrids, defoliation ranged from 4.0 to 59.8 percent as averages of five randomized replications. Extreme contrasts between grasshopper injury of corn and of sorghums were noted. In some cases corn in one field was eaten to the ground while sorghum in an adjacent field was practically uninjured. Although all sorghums show considerable resistance, the sorgos and kafirs were injured less than milo and milo derivatives. As a rule, the varieties and inbred lines of corn showing the greatest resistance originated in areas where grasshoppers are a natural element of the environment. It is suggested that natural selection operating in the development of adapted varieties of corn has tended to intensify resistance to grasshoppers and to other natural insect pests of the region."

A list is given of 11 references to the literature cited.

Some problems of the annual grasshopper survey, R. L. Shotwell. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 4, pp. 523–533*).—This contribution, which supplements the information by the author previously noted (E. S. R., 73, p. 349), considers certain problems that have since developed in the making of surveys in the various States.

Orthoptera of an eastern Nebraska prairie, D. B. Whelan. (Univ. Nebr.). (*Jour. Kans. Ent. Soc., 11 (1938), No. 1, pp. 3–6*).—This is a list of Orthoptera observed in the course of an ecological study of the animals of a prairie located about 9 miles northwest of Lincoln, Nebr.

Observations of grasshopper parasitism in 1937, W. P. Hayes and J. D. DeCoursey. (Univ. Ill.). (*Jour. Econ. Ent., 31 (1938), No. 4, pp. 519–522*).—The results of observations made during July and August 1937 and later of the parasitism of grasshopper nymphs and adults in the vicinity of Urbana, Ill., and Indianapolis, Ind., are considered under the headings of fungus disease, Tachinidae, Sarcophagidae, external mites, and threadworms. The fungus *Empusa grylli* Fr. appears to have been the most effective natural enemy. Sarcophagid parasitism was first noted on July 9, when a single hopper was found infested. A 2.2 percent infestation was noted in late August and early September, and by October 11 the parasitism had increased to 20 percent. "External parasitic red mites (*Eutrombidium locustarum*) were common on hoppers, and an infestation of 17.3 percent was counted in late August and September, and by October 11 all mites had deserted the hosts to continue development in the soil. Mermethid threadworm parasitism in the August-September counts was 13.9 percent in the adults and 22.6 percent in nymphs. The most common species observed was probably *Mermis subnigrescens*. By October 11, most of the threadworms had left the hosts so that on that date only 2 percent parasitism was noted. Structural characters to facilitate the recognition of sarcophagid larvae in grasshopper hosts were investigated."

Cockroaches, J. B. Schmitt (*New Jersey Stas. Circ. 379 (1938), pp. 2*).—A brief practical account.

Control of onion thrips, N. Turner and G. L. Walker. (Conn. [New Haven] Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 4, pp. 489–491*).—In field experiments conducted by the station during the years 1933–37, inclusive, the combination of pure ground cube root with a suitable spreader apparently protected onion plants from the onion thrips when the spraying was commenced before the plants were heavily infested. However, in the one series applied after a heavy infestation the reduction in number of thrips was not so satisfactory as in the other tests. The addition of sulfur increased the mortality in hot weather but apparently reduced it in cooler weather. Since these tests were conducted on irrigated fields drought did not seriously affect the yield of onions, but the irrigation had no marked effect on the number of thrips. It is pointed out that since the productive parts of this work cover only one season no final conclusions can be drawn as to the practical effectiveness of cube root sprays.

Thrips problem demands more concentrated control measures, A. M. Boyce. (Calif. Citrus Expt. Sta.). (*Citrus Leaves, 18 (1938), No. 4, pp. 7, 8*).—In this practical contribution it is pointed out that the problem of the citrus thrips on lemons, on which crop it has become of considerable importance within the past few years, differs considerably from that on oranges. This is due principally to differences in growth and fruiting characteristics between oranges and lemons. Because of its attacking and injuring the buds as well as scarring and deforming the new twigs, leaves, and fruit, the thrips populations must be maintained at the lowest possible level throughout the spring, summer, and fall. It is pointed out that the efficacy of sulfur as a control measure is established, and that at present there is no practical substitute for it.

Citrus thrips problem, with particular reference to southern California, A. M. Boyce. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 23 (1938), No. 7, pp. 288, 316, 317*).—This contribution is the same as that noted on page 72.

A new genus and species of Thysanoptera from greenhouses, J. C. Crawford (*Ent. Soc. Wash., Proc., 40 (1938), No. 4, pp. 109–111*)—Under the name *Asprothrips raui* n. g. and sp. the author describes a new thrips which is found in great numbers on many plants throughout a large series of greenhouses of the New York Botanical Gardens, in which it is by far the most abundant thrips present and a rather serious pest.

Tests of certain materials as controls for the tomato psyllid Paratrioza cockerelli (Sulc.) and psyllid yellows, G. M. List. (Colo. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 4, pp. 491–497*).—In the work in Colorado here reported no marked differences in *P. cockerelli* kills on tomatoes were obtained through the use of dusting sulfur, gashouse sulfur, wettable sulfur, dry lime-sulfur, and liquid lime-sulfur. All gave high kills as shown by nymph counts. "Dusting sulfur, wettable sulfur, dry lime-sulfur, and liquid lime-sulfur gave no significant differences in seasonal protection against the tomato psyllid as estimated from population counts made during the harvest period. Three applications were more effective in controlling the tomato psyllid and preventing psyllid yellows than one and two applications. Dry lime-sulfur and liquid lime-sulfur sprays seriously retarded plant growth and setting of fruit of John Baer tomatoes. Lime-sulfur sprays resulted in reduced yields when compared to the untreated checks, due, apparently, to plant injury. Dusting and wettable sulfurs gave an increase in yield over that of the untreated checks and were found in these tests to be satisfactory insecticides."

Studies on aphides infesting the potato crop.—VI, Aphis infestation of isolated plants, W. M. Davies and T. Whitehead (*Ann. Appl. Biol., 25 (1938), No. 1, pp. 122–142*).—This further contribution (E. S. R., 76, p. 362) reports upon investigations planned to ascertain the extent of the migrations of winged aphids (the green peach aphid), their ability to detect individual potato plants, the development of aphid population following colonization, and the extent to which virus diseases may be transmitted to isolated plants by winged aphids, the details being given in seven tables.

The results "show that winged aphids have no difficulty in detecting and colonizing isolated plants. Their numbers were large at the four eastern centers and very small at the three western centers. In all cases the aphid population on isolated plants was less than that of the nearest general crop and suffered more from predators and parasites. It is shown that isolated plants can be reached by migrants from a distance of at least a quarter of a mile, and probably much further. Additional evidence is given that these initial migrants introduce little virus infection to potato crops from extraneous sources. . . . The practical aspects of protecting potato stocks is discussed under conditions of (1) heavy infestation by winged aphids and proximity of partially diseased crops, (2) minimal winged aphid infestation where numerous sources of virus infection occur in neighboring crops, and (3) where both aphid infestation and sources of infection are minimal. It is considered that regulations for the improvement of health in seed potato stocks should take cognizance of these various possibilities."

Macrosiphum aphids infesting Artemisia, G. F. Knowlton and M. W. Allen. (Utah Expt. Sta.). (*Canad. Ent., 70 (1938), No. 4, pp. 73–83, figs. 71*).—A key to the species (14) and descriptions of 13 and illustrations of 12 forms, of which 5 are described as new, are presented.

Control measures for citrus aphids, J. R. Watson. (Fla. Expt. Sta.). (*Citrus Indus., 19 (1938), No. 2, pp. 6, 7*).—A practical contribution.

Factors affecting the fluctuations in the population of Toxoptera aurantii Boy. in Palestine, E. Rivnay (*Ann. Appl. Biol., 25 (1938), No. 1, pp. 143–154, figs. 4*).—A contribution from the agricultural research station at Rehovoth.

Experiments with aphids as vectors of tulip breaking, P. Brierley and M. B. McKay. (Oreg. Expt. Sta. and U. S. D. A.). (*Phytopathology, 28 (1938), No. 2, pp. 123–129*).—Experiments conducted from 1926 to 1930 have shown that the green peach aphid and the potato aphid are vectors of breaking in tulips. These species are vectors for both of the viruses of breaking distinguished by F. P. McWhorter.[2] *Myzus circumflexus* (Buckt.) apparently transmitted breaking in one trial. "No evidence was obtained to support our earlier report of transmission by *M. solani*. No evidence appeared in our tests that the bulb-infesting species *Anuraphis tulipae* or *Rhopalosiphoninus tulipaella* can transmit breaking. No symptoms appeared during the season of inoculation in any of our experiments."

Three Macrosiphina aphids, G. F. Knowlton. (Utah Expt. Sta.). (*Jour. Kans. Ent. Soc., 11 (1938), No. 1, pp. 13–16, fig. 1*).—*Amphorophora goldamaryae* from goldenrod in Brigham and Logan Canyons, Utah, *A. janesi* in Red Canyon, Utah, host unknown, and *Macrosiphum thermopsaphis* from *Thermopsis pinctorium* in Colorado are described as new.

The aphid genus Pseudoepameibaphis, G. F. Knowlton and C. F. Smith. (Utah Expt. Sta.). (*Jour. N. Y. Ent. Soc., 46 (1938), No. 2, pp. 217–222, figs. 30*).—Five species are recognized as belonging to this genus, of which three, namely, *P. essigi*, *P. xenotrichis*, and *P. zavillis*, all from *Artemisia* spp., are described as new.

The mango shield scale, its fungus parasite, and control, E. W. Berger (*Fla. Ent., 21 (1938), No. 1, pp. 1–4, figs. 2*).—In the summer of 1937 an unusually severe infestation by the mango shield scale *Coccus mangiferae* (Green) occurred in certain plantings on Pine Island, Lee County, Fla. The fungus *Cephalosporium lecanii*, a parasite of not infrequent occurrence in Florida on the soft scales, first received in early June, effected a fair commercial control, although heavily infested trees became black with sooty mold. Brief reference is made to the use of insecticides.

Mantispidae parasitic on spider egg sacs, B. J. Kaston. (Conn. [New Haven] Expt. Sta.). (*Jour. N. Y. Ent. Soc., 46 (1938), No. 2, pp. 147–151*).—A report of observations of parasitism of *Mantispa fuscicornis* Banks in the egg sac of the funnel web weaver *Agelena naevia* Walck.

Caterpillars attacking tomatoes, A. E. Michelbacher and E. O. Essig (*California Sta. Bul. 625 (1938), pp. 42, figs. 19*).—The work with lepidopterous enemies of the tomato in California reported relates particularly to infestation and control of the corn earworm (pp. 3–22). Other forms considered include the cutworms, tomato pinworm, potato tuber worm, and tomato and tobacco worms. The residue problem is discussed.

It is pointed out that while the corn earworm is one of the most important enemies of the tomato fruit the tomato is not the preferred host, and it is necessary for this pest to build up on such crops as sweet corn or beans before tomato plantings are seriously attacked. As a result, destructive infestations in tomato fields are not encountered until the first of August and later. In experimental work, the details of which are given in tables, 40 percent cryolite, 40 percent barium fluosilicate, straight commercial calcium arsenate and 50 percent lead arsenate gave good control. Dusts containing phenothiazine or cuprous cyanide were not as effective as the arsenicals or the fluosilicates. Derris-sulfur dust and pyrethrum-sulfur dust proved ineffective, as did a dust containing Epsom salts. Dusts applied under ideal weather conditions remain effective for from 3 to 4 weeks, and with the most severe infestations encountered not more than three dustings were necessary to protect the tomato crop. When the vines are large, calcium arsenate should be applied at the rate of from 15 to 25 lb. per acre and fluorine dusts at the rate of 30 lb. per acre.

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[2] Phytopathology, 22 (1932), No. 12, p. 998.

Most species of cutworms, which may at times cause serious damage, can be successfully controlled with poison baits. The yellow-striped armyworm *Prodenia praefica* Grote, which is sometimes very destructive to both the foliage and the fruit, cannot be controlled with poison baits scattered over the ground, but is effectively controlled with a dust such as calcium arsenate.

The tomato pinworm, one of the most destructive insects attacking the tomato fruit, does not do widespread damage in the northern tomato-producing area of California. It is known to occur about Merced and Modesto, and a very light infestation is present in the San Francisco Bay area. There is no successful chemical control for this pest, but the destruction of the tomato vines as soon as harvest is complete is an aid in reducing losses.

The potato tuber worm, which is widespread over a large portion of the tomato-growing area of the State, appears to be favored by the cool climate of the coastal regions. Severe damage has been observed only where tomatoes have followed potatoes or have been produced in areas devoted largely to potato culture.

Hornworms (the tomato worm and the tobacco worm), which are most destructive in the warm interior valleys, can be held in partial check when the infestation first develops by hand picking, although later dusting with calcium arsenate may be necessary.

A list of 33 references to the literature is included.

Observations on control of cankerworm by sprays, E. I. McDaniel (*Michigan Sta. Quart. Bul., 21 (1938), No. 1, pp. 32–34, fig. 1*).—The results of several seasons of experimental work with different spray combinations for control of the spring cankerworm and the fall cankerworm on elms along roadsides and on ornamental plantings, conducted with a view to determining the efficiency of various insecticides, are reported in table form. The fall cankerworm has not been a problem where the trees receive a 4 percent application of dormant oil spray for the European elm scale before growth starts in the spring. It has been found that where trees so sprayed are banded with either cotton or Tanglefoot immediately after the spray is applied they are not attacked by the spring cankerworm. Trees sprayed with lead arsenate 3 lb., summer oil 1 qt., and water 100 gal. when the leaves are half-grown are not injured by either species of cankerworm. For general purposes, lead arsenate with an oil spreader-sticker has been satisfactory. None of the 12 sprays tested caused injury to the foliage of the elm or to stands interplanted with sycamore, basswood, hawthorn, maple, or boxelder. These pests are never a problem in well-sprayed orchards or where an effort is made to keep the population down, and one thorough application under average conditions will hold them in check for several years.

Insecticides applied by autogiro to control cankerworms infesting forested areas, C. C. Hamilton. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 31 (1938), No. 4, pp. 513–518*).—Data obtained from the field tests here reported have shown the kill of cankerworms in forested areas to be proportional to the quantity of lead arsenate applied per acre. The reduction in feeding, as indicated by the amount of frass produced, was also proportional to the quantity of lead arsenate applied per acre. Satisfactory commercial control of the cankerworms was obtained with a spray mixture consisting of approximately 23 percent lead arsenate, 9 fish oil, 1 petroleum oil, and 67 percent water. The tests indicate that satisfactory commercial control of cankerworms could be obtained by reducing the amount of lead arsenate to 10 lb. per acre in either 10 or 5 gal. of water.

On the number of molts in larvae of the fall webworm (Hyphantria cunea Drury) (Lep.: Arctiidae), R. B. Swain (*Canad. Ent., 70 (1938), No. 4, pp. 83–85*).—One-half of the 20 larvae reared and here described passed through 8 larval stages, 5 passed through 9, 2 through 10, and 1 through 11.

The control of the pecan shuckworm, J. R. Watson. (Fla. Expt. Sta.). (*Citrus Indus., 19 (1938), No. 3, pp. 7, 18*).—A practical contribution as to the hickory shuckworm on pecans.

Notes on the European pine shoot moth in Connecticut, R. B. Friend, G. H. Plumb, and H. W. Hicock. (Conn. [New Haven] Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 4, pp. 506–513*).—In the studies in Connecticut here reported the authors found the larval population of the European pine shoot moth in red pine stands to be concentrated in the tops of the trees. It is pointed out that this tendency to attack the tips on the upper branches of the trees is advantageous to the larvae because of the more available supply of food in this part. At the same time it enables a small number of larvae to injure the tree seriously. "In very heavily infested stands the injury may be so severe that the upper whorls of branches will not produce an average of one normal shoot each in the growing season. The presence of 50 to 80 living larvae per tree in the fall, or the emergence of 25 adults in the spring, is a population of sufficient density to cause significant damage to the stand. This density may be reached in 3 to 5 yr. after a stand becomes infested. The population necessary to injure trees is the same for all trees from 6 to 25 ft. in height. The shoot moth population increases rapidly at first, then more slowly. Whether or not a saturation point is reached depends much on the height of the trees. If the population is at a low level when the stand closes injury to the trees is usually negligible. There is a heavy mortality of larvae of all stages up to the fully grown condition, and evidence points to a heavy adult mortality before the females lay all their eggs."

Hyssopus thymus Gir., which attacks all stages found in buds and shoots, is the most common larval parasite present, usually occurring in about 3 percent of the injured tips. *Orgilus obscurator* Nees, an introduced European species, was found in significant numbers in one stand.

Further notes on some alternative hosts of the oriental fruit moth parasite Glypta rufiscutellaris Cress., W. L. Putman (*Canad. Ent., 70 (1938), No. 5, pp. 89, 90*).—The notes here presented supplement a preliminary contribution on the native hosts of oriental fruit moth parasites (E. S. R., 73, p. 364). *G. rufiscutellaris* was recorded from an unknown leaf tier on hawthorn in 1934, which has been identified as *Epinotia* sp., presumably *laracana* Kft.

The army worm outbreak in Nova Scotia in 1937, A. D. Pickett (*Canad. Ent., 70 (1938), No. 4, pp. 86, 87*).—An outbreak here described, which occurred in Nova Scotia during the last few days of July and the first half of August 1937, is said to have been the worst armyworm outbreak which has occurred in that Province.

Roundworm attacking pea moth, A. D. Baker (*Canad. Ent., 70 (1938), No. 6, p. 132*).—A report is made of an investigation of the pea moth on the Gaspé coast, an account of which pest has been noted (E. S. R., 78, p. 824). Observations have shown that a high mortality of the larvae may occur while they are in their cocoons in the soil and indicate that a nematode of the genus *Neoaplectana* is responsible.

Ornix prunivorella Chambers (Lepidoptera: Tineidae), a pest of the apple tree in the lower Missouri River Valley region, L. M. Copenhafer and R. L. Parker. (Kans. Expt. Sta.). (*Jour. Kans. Ent. Soc., 11 (1938), No. 2, pp. 37–53, figs. 28*).—Damage caused by a leaf-mining insect in the apple-growing region of northeastern Kansas led to the discovery that the unspotted tentiform leaf miner *O. prunivorella* may infest from 90 to 95 percent of the leaves of the apple tree to the number of from one to nine mines per leaf.

This moth overwinters in both the larval and pupal stages. During the summer the life cycle is completed in from 4 to 5 weeks. The larvae eat the inner leaf tissue and in this way form the mines. Spray materials enter the leaf at points of injured leaf tissue and cause an additional injury known as spray burn.

A study of its control indicates that nicotine insecticides applied in the last four cover sprays for the codling moth also control the leaf miner without additional spraying operations. The use of a 40 percent nicotine sulfate-summer oil emulsion spray, the most effective, reduced markedly the infestation of this pest. Nine different hymenopterous parasites, one representing the new genus and species *Xenosternum (Epirhyssalus) ornigis* Mues.,[3] have been reared from the pest.

The horseflies of the subfamily Tabaninae of the Nearctic region, A. Stone (*U. S. Dept. Agr., Misc. Pub. 305 (1938), pp. 172, figs. 79*).—A revision of the subfamily Tabaninae, which includes keys for the separation of the 11 genera and 154 species recognized, of which 14 species and 1 variety are described as new. A brief discussion of their economic importance and of characters used in their classification is included.

Blackflies from Utah and Idaho, with descriptions of new species (Simuliidae, Diptera), C. R. Twinn (*Canad. Ent., 70 (1938), No. 3, pp. 48–55, figs. 6*).—Descriptions and distribution records are given for 6 new species of *Simulium* found among 700 specimens collected in various parts of Utah and Idaho.

Biology of the tachinid Winthemia datanae Tns., F. L. Marsh (*Psyche, 44 (1937), No. 4, pp. 138–140*).—Information on the life history of the tachinid parasite *W. datanae* is presented. It is pointed out that its habit of ovipositing only on mature caterpillars, the failure of many of the maggots to escape from the host cocoon, and the great sensitiveness to dehydration on the part of both hibernating larvae and the puparia are responsible for its not being a more effective parasite of *Cecropia* in the Chicago area.

On the bionomics and structure of some dipterous larvae infesting cereals and grasses.—III, Geomyza (Balioptera) tripunctata Fall., I. Thomas (*Ann. Appl. Biol., 25 (1938), No. 1, pp. 181–196, figs. 10*).—A further contribution (E. S. R., 73, p. 213) on *G. tripunctata*, the chief larval host plants of which in the field are *Lolium perenne* and *L. italicum;* in the laboratory other grasses and wheat are readily attacked. Its damage is similar to that caused by the frit fly, the larva feeding inside the grasses and killing the central shoot.

The carrot rust fly, W. D. Whitcomb (*Massachusetts Sta. Bul. 352 (1938), pp. 36, pls. 4, figs. 3*).—This contribution reports upon the history and distribution; host plants; injury caused; seasonal abundance; life history, seasonal history, and habits; and control of the carrot rust fly, first found in North America at Ottawa, Canada, in 1885 and now reported from 15 States, principally in the northeastern and northwestern parts of the country. Carrots, parsnips, celery, and parsley are most commonly damaged by this insect, but it has attacked several other plants of the family Umbelliferae in Massachusetts. Its damage is caused by the feeding of larvae on the fleshy roots.

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[3] Ann. Ent Soc. Amer., 28 (1935), No. 2, pp. 246–248.

The carrot rust fly hibernates as a pupa in the soil, the majority of them within 6 in. of the surface, although they may be 10 in. deep. In Massachusetts the flies have appeared about May 25, and more of them emerged on days when the temperature was 60° F. or less than when it was higher. In laboratory studies a temperature of 65° and a soil moisture of 25-percent saturation were most favorable for emergence. Female flies are slightly more abundant than males, although there may be a greater proportion of males early in the emergence period. The flies are short-lived, and in confinement lived from 9 to 11 days at cool temperatures and from 2.6 to 3.8 days at 85°.

"Eggs are laid singly in or on the soil near the plant, and the number per female has varied from a maximum of 35 to an average of 6 to 18. The greatest number of eggs was laid at 55° to 65°, and the principal oviposition period of flies of the overwintering generation extended in three seasons from May 27 to June 3. Eggs hatch in 6 to 9 days under normal conditions but required 20 days at 55°. In constant-temperature studies no larvae hatched from eggs held at 85°, and 65° and 75° were the most favorable temperatures for incubation of the eggs.

"The feeding period of the larvae covers about 4 weeks, varying from 27.55 days in 1928 to 30.1 days in 1929; and approximately the same length of time is spent in the soil as prepupae and pupae. In 1930 there were indications that unfavorable soil conditions extended their period in the soil to 7 weeks. In these studies 75 to 85 percent of the flies of the first generation emerged between August 10 and August 25.

"The life cycle is completed in 9 to 11 weeks. The time required for the development of the second generation corresponds very closely with the same period for the first generation. No studies of a third generation have been made, but it is evident that one develops in some seasons."

Cultural practices which provide unfavorable conditions for development and reproduction are said to be important factors in controlling the carrot rust fly. Treatment of the seed with one-half of its weight of calomel protected early carrots from damage by the first generation of the fly, but was not so effective on late carrots against the second generation. Undiluted calomel was more effective than calomel diluted with clay. "In laboratory experiments with insecticides, eggs and adults of this insect were killed by derris sprays and dusts more effectively than with other insecticides. Ground derris root killed all the flies in 24 hr. when the flies were caged with dusted plants 4 days after the dust was applied. Spraying or dusting carrots for pest control is not generally considered practical or economical in Massachusetts, but where yields of 500 bu. per acre are obtained, or in seasons when severe damage by this insect places a premium on uninfested carrots, insecticides should be worth while. When used, insecticide applications should begin about June 1 on early carrots and about August 1 on late carrots. In the early experiments, undiluted ground derris root was the most effective insecticide, but this is too expensive for use on carrots. Later, a cube-clay dust containing 0.6 percent rotenone gave good results against a light infestation, and its use is recommended. Mercury compounds and fluosilicate mixtures have not been consistently effective, and bordeaux-oil emulsion and nicotine were unsatisfactory. Naphthalene, soot, and ground tobacco have been effective as repellents. Naphthalene is preferred when used at the rate of 1 lb. to 100 ft. of row, and is recommended in three or four applications on late carrots."

A list of 24 references to the literature is included.

A South African Onthophagus found in United States (Coleoptera: Scarabaeidae), O. L. Cartwright. (S. C. Expt. Sta.). (*Ent. News, 49 (1938), No. 4, pp. 114, 115*).—The author records the collection of the South African scarabaeid *O. depressus* Har. near Vidalia and Lyons, Ga.

Progress of Japanese beetle investigations, C. H. Hadley. (U. S. D. A.). (*Jour. N. Y. Ent. Soc., 46 (1938), No. 2, pp. 203–216*).—A progress report presented with a list of 27 references to the literature.

A new species of Phyllophaga (Coleoptera, Scarabaeidae) from Kentucky, P. O. Ritcher. (Ky. Expt. Sta.). (*Ent. News, 48 (1937), No. 10, pp. 285–287, figs. 5*).—A May beetle, taken on bur, red, and pin oak, walnut, and elderberry at Lexington, Ky., is described as new under the name *P. kentuckiana.*

A field key to Kentucky white grubs, P. O. Ritcher. (Ky. Expt. Sta.). (*Jour. Kans. Ent. Soc., 11 (1938), No. 1, pp. 24–27, figs. 4*).—A field key is given for the identification of 14 of the 26 species of May beetles known to occur in Kentucky, i. e., *Phyllophaga praetermissa* (Horn), *P. implicita* (Horn), *P. arkansana, P. inversa* (Horn), *P. ephilida* (Say), *P. fusca* (Froehl.), *P. fervida, P. tristis* (Fab.), *P. micans, P. bipartita* (Horn), *P. futilis* (Lec.), *P. hirticula* (Knoch), *P. crenulata* (Froehl.), and *P. prunina.*

Field investigations upon the control of the mustard beetle Phaedon cochleariae F. on watercress, E. E. Edwards (*Ann. Appl. Biol., 25 (1938), No. 1, pp. 197–205, pl. 1*).—The results of field experiments with pyrethrum and derris preparations for the control of *P. cochleariae* on water cress plants conducted in 1935 are reported.

Effective duration of toxicity to the Mexican bean beetle of derris deposits on foliage, J. N. Todd. (S. C. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 4, pp. 478, 479*).—The mortality obtained from the application of derris to bean plants in the control of the Mexican bean beetle is summarized in table form. Derris when applied to bean foliage under field conditions did not afford protection against this beetle beyond 7 days of exposure. On shaded bean plants protected from the weather derris was very effective over a period of 2 weeks or as long as the plants held up.

Studies of the biology of the death-watch beetle Xestobium rufovillosum De G.—II, The habits of the adult with special reference to the factors affecting oviposition, R. C. Fisher (*Ann. Appl. Biol., 25 (1938), No. 1, pp. 155–180, figs. 6*).—This contribution is the second in a short series on biological studies of *X. rufovillosum* (E. S. R., 79, p. 228).

Preliminary studies of wireworms affecting potato tubers in North Dakota, J. A. Munro and L. A. Schifino. (N. Dak. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 4, pp. 487, 488*).—The information obtained from an investigation conducted in North Dakota in 1937 and here reported includes the results of a survey of wireworm injury and the relative importance of wireworm species. *Corymbites aeripennis destructor* Brown was found to be the most abundant species and of greatest concern in the Red River Valley, several other species found apparently being of no economic importance.

The reactions of wireworms to arsenicals, C. E. Woodworth. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 3, pp. 229–238*).—Experiments conducted with the Pacific coast wireworm, designed to explain the failure of baits poisoned with arsenic to attract and kill, are reported. Experiments are also presented that show how and where soluble arsenical salts in solution may enter the body of the wireworm. When confined on moist cellucotton with poisoned or unpoisoned cornstarch pellets in glass and metal cages, the wireworms exhibited a repellency according to the solubility of the arsenic that was present. Arsenic was not ingested even though the pellets containing it were burrowed through. Nontoxic materials were refused unless the particle size was very small. Wireworms were killed by the soluble arsenicals even though the pellets were not attacked. No arsenic was found in the digestive tract of most of the killed wireworms, though it was found in the blood of these larvae. In the latter part of the study the wireworms were submerged in arsenical solutions and the various tissues tested for the presence of arsenic. Water containing sodium arsenite entered the bodies of the wireworms, carrying the arsenic with it. It did not enter by way of the mouth, anus, or tracheae, but through the integument, which was found to be pervious both to water and to the sodium salts of arsenic.

Notes on an interesting food habit of false wireworm adults, H. H. Walkden and H. R. Bryson. (U. S. D. A. and Kans. Expt. Sta.). (*Jour. Kans. Ent. Soc., 11 (1938), No. 1, pp. 10–13*).—Observations of the habit of false wireworm adults of congregating in large numbers on mounds of the mound-building prairie ant *Pogonomyrmex occidentalis* Cress. in wheat-stubble fields in Kansas and robbing the ants of seeds are contributed. The authors consider it evident that this habit of robbing ants of their food is possessed by several species of false wireworms, since collections made on anthills in several localities revealed the presence of *Eleodes obsoleta* Say, the Plains false wireworm, *E. suturalis* Say, *E. tricostata* Say, and *Eusattus difficilis* Lec.

The wireworm problem, H. W. Miles (*Ann. Appl. Biol., 25 (1938), No. 1, pp. 211–214*).—This is a discussion of wireworm control, with special reference to the northwest of England.

Life history and control of the cowpea curculio, F. S. Arant (*Alabama Sta. Bul. 246 (1938), pp. 34, figs. 12*).—This contribution, presented with a list of 27 references to the literature, reports upon studies of the life history and habits (pp. 6–17), field experiments on insecticidal control (pp. 18–28), and studies on natural and agronomic control (pp. 28–31) of the cowpea curculio. Experiments made with 14 leading garden varieties of cowpeas revealed a mean infestation of 36 percent over a 3-yr. period, and infestations of 65 percent and above were recorded. String beans, cotton, strawberries, and other crops serve as food for the adults, principally before cowpeas are available.

"Two generations of the insect occur annually in cowpeas in Alabama. The female deposits her eggs in excavations in peas; there the larvae develop to maturity, emerge from the dry pod, and pupate in the soil. The time required for development from egg to adult varies with environmental conditions. Records on insects developing outdoors showed variations of from 23 to 53 days with a mean of 30.8 days. The maximum number of eggs deposited by one female was 281; the mean was 112.7. . . .

"A tachinid fly and several species of ants are the most important insect enemies of the cowpea curculio. Hot, dry weather is the most important climatic factor in the natural control of the insect.

"Certain garden varieties of cowpeas are more resistant to attacks of the cowpea curculio than others. Of the 14 varieties tested, California Blackeye and White Crowder were the most susceptible, Conch and Taylor the most resistant. It is doubtful, however, whether any variety is sufficiently resistant to escape serious injury in the absence of more susceptible varieties.

"Larvae do not often emerge from the peas until after the pods are dry. If the pods are harvested and stored on a tight, dry floor, the larvae perish. Adults are difficult to poison due to their habit of feeding within the pods of peas. According to results of field experiments during 1931–35, calcium arsenate is significantly more efficient than any other insecticide tried for controlling the cowpea curculio; sodium fluosilicate is next in efficiency. The percentage of control for the various materials used in the experiments were as follows:

Calcium arsenate 74.53, sodium fluosilicate 67.11, magnesium arsenate 61.57, acid lead arsenate 50.93, barium fluosilicate 40.06, cryolite 26.22, pyrethrum 28.68, florote 3.71 [and] derris —2.97 percent. Both calcium arsenate and acid lead arsenate caused severe burning of foliage.

"According to the results of a series of replicated field experiments in 1936, an efficient insecticide applied as a dust to cowpeas on small plats reduces the cowpea curculio infestation on adjacent plats. The percentages of control, 70.72, 64.28, and 65.10 for autoclaved calcium arsenate, magnesium arsenate, and 'extra light' sodium fluosilicate were not significantly different. It is believed that the drifting of dusts may account for the absence of significant differences.

"Sodium fluosilicate is the most satisfactory material for the control of the cowpea curculio. This material should give 70 to 75 percent control under farm conditions."

The occurrence of Sitona lineatus L. in British Columbia, W. Downes (*Canad. Ent., 70 (1938), No. 1, p. 22*).—The small gray weevil *S. lineatus*, the larvae of which are serious pests of the roots of leguminous plants, including peas, beans, vetches, clover, and alfalfa, in Europe, has been found seriously injuring seedling peas in British Columbia. The weevil is already quite widespread and abundant in the Victoria district, the first reports having been received from the city area, but it was later taken in numbers on red clover at Keeting, 12 miles north on the Saanich Peninsula. This appears to be the first record of the occurrence of this weevil in North America.

On certain habits of elm bark beetles, B. J. Kaston and D. S. Riggs. (Conn. [New Haven] Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 4, pp. 467–469, figs. 3*).—The authors have found the native elm bark beetle to make feeding tunnels in healthy elms before constructing brooding galleries in sickly trees. These tunnels are in the bark alone and do not touch the surface of the wood. The trunk of the tree is preferred, but tunnels may be found from the exposed roots all the way up to branches less than an inch in diameter. Usually, more than one feeding tunnel is made by each beetle. Bark tunnels made for hibernation tend to be longer, and are more often in thicker bark, than the otherwise similar feeding tunnels. It is believed that the latter are analogous to the well-known crotch and twig feeding injuries of the smaller European elm bark beetle, and hence important in relation to the spread of the Dutch elm disease.

Field notes on the life history of Hylurgopinus rufipes (Eich.), C. H. Martin. (Cornell Univ.). (*Jour. Econ. Ent., 31 (1938), No. 4, pp. 470–477, figs. 3*).—Continuing earlier work (E. S. R., 75, p. 524), the data here presented are based on life history observations conducted at Patterson, N. Y., over a 3-yr. period. The majority of the native elm bark beetle adults have been found to come from hibernation during May, the peak occurring the last part of that month. These adults lay the majority of their eggs in about 3 weeks. The first larvae hatch in mid-June; the last hatch the last part of July. Pupae appear in numbers around the last part of July and the first part of August. The peak of emergence of adults from these pupae is about mid-August. The adults apparently go into hibernation immediately. Apparently if the logs are shaded the degree of shade in which they are placed does not affect the native elm bark beetle infestation. The logs in the sun reduce infestations because the part of the log exposed to the sun becomes hot enough to kill the beetles attempting entrance in this area. Throughout the summer small numbers of adults enter the logs and lay eggs. Only a few of these adults can be considered as a true partial generation; these originate from eggs laid very early in the season. The rest arise from larvae which mature after passing through the winter. Some of the larvae overwinter because they hatch too late to do otherwise, while others probably are in a diapause state. Some larvae pass through a second winter but are not observed to emerge. The average number of overwintering larvae from eggs laid by beetles entering logs in early May was found to be 0.032 per maternal tunnel, while 128 times this number from eggs laid by beetles entering in July overwintered. Although the average number of eggs per maternal tunnel was 56.1±0.77 eggs, yet there was an emergence of only 3.9 adults per maternal tunnel from eggs laid by adults from hibernation.

A preliminary study of the biology of Scolytus sulcatus LeC., L. L. Pechuman. (Cornell Univ.). (*Jour. Econ. Ent., 31 (1938), No. 4, pp. 537–543, figs. 2*).—A summary of the present knowledge of the biology, habits, and distribution of *S. sulcatus*, based upon work of the Dutch elm disease laboratory in New York State, is presented. This bark beetle, first described in the State in 1868, after having disappeared for 65 yr. has been found to be widespread in central and eastern New York, western Connecticut, and northern New Jersey. "Apparently its favorite host is apple, but it frequently breeds in elm and it has been recorded from plum. It is probably a distinct species, and the adult is not easily confused with any species of *Scolytus* likely to be associated with it. Emergence in southeastern New York is from May until September with the peak in early June. The adults are long lived, some living more than 2 mo. under experimental conditions. The males emerge first in the spring, but the total emergence of each sex is about the same. Feeding by the adults is probably necessary before eggs are laid; feeding may take place on twigs of elm or apple or in the bark of the host tree. Twig feeding on elm is of primary importance from the standpoint of the possibility of transmission of the Dutch elm disease organism. Weakened or dying branches of elm or apple are usually selected for oviposition. The female probably does all the work in connection with the construction of the maternal tunnel, which is of a simple longitudinal type. The usual number of eggs is 40 to 60. The larvae tunnel across the grain of the wood, but as they mature they make tunnels which meander in all directions. In late summer or fall the larva contructs a cell, in the wood or occasionally beneath the bark, in which the winter is passed. A few larvae overwinter beneath the bark and continue their development the following season. A prepupa and pupa are formed in May. The adult does not emerge from the pupal cell for several days after transforming. There is one generation a year in New York, but some individuals require 2 yr. to complete their development. Woodpeckers are probably the most important of the natural enemies. Competition offered by other insects may also be important in elm. The value of the role played by insect predators and parasites is unknown."

The host plants and parasites of the cowpea curculio and other legume infesting weevils, T. L. Bissell. (Ga. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 4, pp. 534–536, figs. 2*).—Report is made of collections of some 20 species of wild and cultivated legumes during the summer and fall months of 1936 and 1937 in a search for host plants of the cowpea curculio in central Georgia. In addition to the cowpea curculio numerous other weevils and parasites were procured from the seeds. The weevils considered include *Chalcodermus collaris* Horn, *C. inaequicollis* Horn, *Apion crassum* Fall, *A. decoloratum* Smith, *A. griseum* Smith, *A. segnipes* Say, *Amblycerus robiniae* (F.), and the pea weevil.

Notes on oviposition and sex ratio in Hyposoter pilosulus Prov. (Hym.: Ichneumonidae), R. B. Swain, W. Green, and R. Portman (*Jour. Kans. Ent. Soc., 11 (1938), No. 1, pp. 7–9*).—Brief report is made of an experiment undertaken at Fort Collins, Colo., to determine the sex ratio of *H. pilosulus*, a primary ichneumonid parasite of the fall webworm.

Tetrastichus brevistigma Gahan, a pupal parasite of the elm leaf beetle, P. A. BERRY (*U. S. Dept. Agr. Circ. 485 (1938), pp. 12, figs. 3*).—Studies of the distribution, life history and habits, and effectiveness are reported and descriptions given of the several life stages of *T. brevistigma*, an internal, gregarious parasite which attacks the pupa of the elm leaf beetle. This parasite, first discovered in August 1932 in Massachusetts and now well distributed throughout the northeastern part of the United States, overwinters as a full-grown larva in the dead pupa of its host and emerges early enough in the spring to attack the first elm leaf beetle pupae that are formed. It passes through three or four generations a year and produces females parthenogenetically, males being very rare. Parasitization to the extent of from 50 to 80 percent is quite common during the latter part of the season.

Controlling one of our major pests, the citrus red mite, A. M. BOYCE and D. T. PRENDERGAST. (Calif. Citrus Expt. Sta.). (*Citrus Leaves, 18 (1938), No. 5, pp. 1, 2, 28*).—A practical contribution.

Control of citrus red mite (spider), A. M. BOYCE and D. T. PRENDERGAST. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 23 (1938), No. 9, pp. 370, 398, 399, 340*).—A practical contribution.

The American dog tick, eastern carrier of Rocky Mountain spotted fever, F. C. BISHOPP and C. N. SMITH (*U. S. Dept. Agr. Circ. 478 (1938), pp. 26, figs. 13*).—A summary of information on the economic importance, distribution, hosts, life history, seasonal incidence and overwintering, and natural and artificial control, which includes six tables with information as to the developmental periods in the life of this tick.

ANIMAL PRODUCTION

Seasonal changes in the chemical composition of some important Arizona range grasses, E. B. STANLEY and C. W. HODGSON (*Arizona Sta. Tech. Bul. 73 (1938), pp. 449–466, figs. 10*).—Seasonal changes in the chemical composition of blue grama, hairy grama, and curly mesquite grasses were determined through analysis of samples collected at from 10- to 14-day intervals from early August (after new growth had started) to November (when the plants were mature and dry) and at monthly intervals during the winter season. The data are presented in graphic form. The moisture, crude protein, and phosphorus were high in the young plants but steadily declined to a minimum when the plants were mature. Total ash and ether extract failed to show definite trends. Nitrogen-free extract and lignin steadily increased from early growth stages to maturity, while crude fiber rose rapidly during early growth and was variable thereafter. Calcium was high in young plants and low during the winter but varied during the intervening period. The digestibility and palatability, which were high in young plants, decreased to low values as the plants became mature and dry.

Grass volume tables for determining range utilization, T. LOMMASSON and C. JENSEN. (U. S. D. A.). (*Science, 87 (1938), No. 2263, p. 444*).—The development of volume tables for estimating percentage volume utilization of range by various species of animals is announced.

The stability of carotene in plant tissues, M. W. TAYLOR and W. C. RUSSELL. (N. J. Expt. Stas.). (*Jour. Nutr., 16 (1938), No. 1, pp. 1–13, fig. 1*).—Studies on the rate of carotene destruction in various hays and silages are reported. Chopped, artificially dried alfalfa stored in bags at barn temperature lost 50 percent of its carotene during 3 months of storage in the late summer and early fall. No further losses occurred during the winter months, but an additional 25 percent loss occurred during the succeeding summer season. Both exclusion of air and low temperature are important factors in the carotene preservation as shown by the very slight losses of carotene in finely ground artificially dried alfalfa stored in vacuo in the dark at approximately 0° C. for 20 mo. Silages varied widely in rate of carotene loss. Regular corn silage lost carotene very rapidly during drying in vacuo and in storage in vacuo in the dark at 0°. A. I. V. corn silage lost approximately 20 percent of its original carotene content during 5 months' storage, while very slight losses occurred in A. I. V. alfalfa silage over a like period. Bio-assays of hays stored in vacuo and of regular corn silage showed that carotene content was a good index of vitamin A potency but in barn-stored hays bio-assays gave lower values, suggesting that as carotene was destroyed the remaining carotene was rendered less potent biologically.

The alleged toxicity of free fatty acid and nitrogen in cod liver oil, H. D. BRANION, A. F. DAWSON, J. R. CAVERS, and I. MOTZOK (*Poultry Sci., 17 (1938), No. 3, pp. 213–223*).—Tests at the Ontario Agricultural College in which cod-liver oils varying in acidity from less than 1 to over 20 percent were fed at 1-, 2-, and 3-percent levels in the diet of growing chicks and also the feeding of oils in which cod fatty acids either predominated or were added gave evidence that free fatty acids in cod-liver oil are not toxic as judged by weight-feed-gain ratios, mortality, calcification, feathering, and post-mortem examinations. Feeding "blown" cod-liver oil also gave no harmful effect, indicating that the oxidation products arising during the development of rancidity are nontoxic. There was no evidence that the nitrogenous materials present in these cod-liver oils were harmful, suggesting that differences may exist in the relative toxicity of the nitrogen fraction of various oils since the nitrogen provided by cod-liver oil in these diets was greater than the amount shown to be injurious by other investigators.

Commercial feeding stuffs—report on inspection, 1937, E. M. BAILEY (*Connecticut [New Haven] Sta. Bul. 414 (1938), pp. 573–673+XVII–XX*).—This is the usual report of the analyses and guaranties of 826 samples of feeding stuffs and 19 samples of dog foods collected for official examination during the calendar year 1937 (E. S. R., 78, p. 86).

Commercial feeds in Kentucky in 1937, J. D. TURNER, H. D. SPEARS, W. G. TERRELL, and J. J. ROSENBERG (*Kentucky Sta. Regulat. Ser. Bul. 15 (1938), pp. 48*).—A summary of the results of microscopic examination and analyses of 1,344 samples of commercial feeding stuffs, together with the guaranteed and found analyses of 55 samples of dog feeds, chemical standards for special-purpose feeds, and information on the toxicity of phosphate rock in feeds, are presented (E. S. R., 79, p. 88).

Analyses of commercial feeding stuffs and registrations for 1938, C. S. CATHCART (*New Jersey Stas. Bul. 648 (1938), pp. 64*).—A summary of the results of the 1937 feed inspection and a tabulation of the guaranteed and found analyses of 1,486 samples of feed are presented (E. S. R., 78, p. 86).

1937 analyses of mixed feeds (*N. C. Dept. Agr. Bul., 1938, Mar., pp. 71*).—A tabulation of the guarantees and found analyses for protein, fat, and fiber in 1,148 samples of feeds collected for official examination, along with definitions of feeding stuffs and other suggestions for the manufacture and use of mixed feeds, is presented.

Animal physiology: Nutrition and breeding (*[Gt. Brit.] Agr. Res. Council Rpt., 3 (1935–37), pp. 178–216*).—This presents a brief résumé of numerous lines of investigation in progress at the several animal husbandry research institutions in Great Britain.

Growth and development, with special reference to domestic animals.—XLVIII, Relation between body weight, amount of wool or feathers, and temperature regulation, S. Brody and J. Campbell (*Missouri Sta. Res. Bul. 287 (1938), pp. 27, figs. 11*).—Continuing this series (E. S. R., 79, p. 530), the interrelation between the amount of body covering and body size of sheep and of various domestic fowls and birds has been investigated. In yearling sheep, wool weight was found to be nearly directly proportional to surface area of the body. However, with advance of age body weight increased to a greater extent than wool weight, resulting in a decrease in wool weight per unit of surface area in older animals. In growing domestic fowls total feather weight tended to vary with body weight rather than with body surface area, as was true for the contour feather weight of various species of birds. However, in these species of birds contour feather number varied approximately with the 0.2 power of body weight, suggesting that neither feather weight nor feather number is a satisfactory index of the insulating or thermoregulatory capacity of feathers.

The vitamin needs of farm animals (*Ohio Sta. Spec. Circ. 52 (1938), pp. 12*).—The nature and function of the commonly known vitamins, the vitamin content of common feeds, and the vitamin requirements and satisfactory sources of vitamin supply for dairy cattle, beef cattle, sheep, swine, and poultry are briefly discussed.

[Investigations with livestock in Georgia]. (Coop. U. S. D. A.). (*Georgia Coastal Plain Sta. Bul. 28 [1937], pp. 12, 40–71, figs. 5*).—Progress reports (E. S. R., 77, p. 78) for various lines of investigation include the returns secured by grazing steers on variously fertilized lowland and upland permanent pastures and on kudzu, wintering the beef breeding herd, the production of feeder calves and veal calves, wintering feeder calves and steers, the use of a trench silo, the management of brood sows and their litters, and the returns secured from a year-round grazing system for hogs. The results of a feeding trial with six lots of steers comparing the feeding value of (1) the field grazing of corn and velvetbeans; (2) snapped sorn, velvetbeans, and peanut hay; (3) snapped corn, cottonseed meal, and peanut hay; (4) snapped corn, peanut meal, and peanut hay; (5) ground snapped corn, cottonseed meal, and peanut hay; and (6) cottonseed meal and hulls; and of a trial to determine the value of molasses as a supplement to ground snapped corn, ground velvetbeans, and peanut hay for fattening steers are reported in detail.

[Investigations with livestock in Idaho], H. P. Magnuson, C. W. Hickman, C. E. Lampman, J. Toevs, and R. J. Johnson (*Idaho Sta. Bul. 225 (1938), pp. 11, 12, 30–32, 60–63, 64, 67, 70–72, 73, 74, 75, figs. 3*).—Included are brief progress reports on the calcium and phosphorus content of range plants in early and late summer; the influence of phosphorus in the ration of fattening calves and lambs; the phosphorus requirements of growing and fattening lambs, and at the Caldwell Substation the value of various protein supplements in the ration of fattening steers and lambs, and the maximum use of pasture for fattening steers; and at the Aberdeen Substation a comparison of feeding methods for spring lamb production. Poultry tests reported deal with the vitamin A requirements of laying hens; the manganese content of orchard grass and its value in preventing perosis; the effect of varying humidity on artificial incubation; and the importance of protein and minerals in turkey rations. The carotene content of numerous hay and pasture plants and the effect of various storage conditions on carotene preservation are noted.

[Livestock investigations in North Carolina]. E. H. Hostetler, J. E. Foster, J. O. Halverson, E. R. Collins, H. H. Boling, W. H. Rankin, R. E. Nance, R. E. Stitt, H. M. Vinall, F. W. Sherwood, R. S. Dearstyne, C. H. Bostian, J. J. Hutchinson, C. Dearing, C. O. Bollinger, S. C. Clapp, and G. K. Jones. (Partly coop. U. S. D. A.). (*North Carolina Sta. Rpts. 1936, pp. 48–54, 56, 57, 58; 1937, pp. 67–72, 75, 76, 77, 78*).—Included in both reports are progress reports on the following studies: The relation of the rate of growth in pigs when controlled by level of feeding to the production and quality and palatability of meat, the effects of feeding varying amounts of soybeans to pigs, fish meal v. peanut oil meal for fattening pigs, the comparative quality of meat of yearling v. 2-year-old grade Hereford steers, the value of native reeds for summer grazing of beef cattle, comparative gains on reed v. tame pastures, the value of crop gleanings for wintering beef cattle, vitamin A deficiency in cottonseed meal for beef cattle, the cost of finishing steers, a comparison of roughages in the steer finishing ration, the utilization of various types of pastures by sheep, and a combined starter and developer mash v. separate starter and developing mashes for efficient and economic development of birds to laying age. That for 1936 also presents information on the returns secured from hogging down soybeans, fish meal v. soybean meal for fattening pigs, methods of establishing permanent pastures, changes in meat and wool characteristics resulting from the use of purebred mutton rams on native ewes, and the vitamin B in soybeans and the G complex in soybean and linseed meals; and that for 1937 the vitamin A, B (B_1), and flavin component in soybeans and cowpeas, the value of yeast in poultry feeding and a comparison of yeast-fermented mash with wet mash supplemented with killed yeast and with live yeast, the relation to egg production of feeding a portion of mash fermented by yeast, the effect of lighting Leghorn pullets on egg production, and the influence of line breeding and controlled mating on the livability of poultry.

[Animal husbandry research in Pennsylvania] (*Pennsylvania Sta. Bul. 360 (1938), pp. 28, 30, 31, 41, 42, figs. 2*).—Progress of research is briefly noted on the most profitable type of steer for winter feeding, soybean oil meal as a source of protein for lambs, alfalfa forage for and protein requirements of pigs, poultry rations, and nutritional studies with ring-necked pheasant chicks.

A report on the conditions of animal production in Australia, J. Hammond (*Austral. Council Sci. and Indus. Res. Pam. 79 (1938), pp. 24, fig. 1*).—Based on an extensive tour of inspection in all States, this report deals with the present status of the methods of production in Australia in the beef cattle, dairy cattle, swine, and sheep industries, with special reference to breeding for production, nutrition, husbandry, and the type and quality of meat products being marketed, with suggestions for improving present practices.

Steer fattening investigations, J. H. Jones, R. A. Hall, J. M. Jones, and W. H. Black. (Coop. U. S. D. A.). (*Texas Sta. Bul. 564 (1938), pp. 51, figs. 24*).—Three feeding trials comparing ground ear corn v. ground hegari heads for fattening steer calves and yearlings gave evidence that the hegari heads needed to be priced about 28 percent lower than corn to give equal financial returns. The corn produced quicker and more finish as shown by the higher dressing percentage, higher carcass grades, and slightly higher selling price. Similar trials showed that ground hegari stover and ground sumac fodder were practically equal when fed with ground ear corn and cottonseed meal. The former produced slightly more gains but less finish than the latter.

Four trials to determine the value of feeding cottonseed cake as a supplement to Sudan grass pasture for yearling steers indicated that the use of Sudan grazing very greatly reduced the amount of concentrate feeds required per unit of gain, and that the liberal feeding of cottonseed cake (over 3 lb. per head daily) for 100 days or more while grazing Sudan would reduce the time required for finishing in dry lot by about 30 days. Feeding a calcium supplement in wintering rations and during Sudan grazing did not increase the gain or finish, but supplying 0.1 lb. of ground limestone per head daily while fattening in dry lot materially increased the rate of gain in each trial.

Heavy cottonseed meal feeding for fattening yearling steers, J. H. Knox. (N. Mex. Agr. Col.). (*N. Mex. Stockman, 3 (1938), No. 6, p. 7, figs. 2*).—In the steer fattening trial reported, four groups were compared over a 168-day feeding period. All groups received corn silage and alfalfa hay. Concentrate rations consisted of (1) ground kafir with a small amount of cottonseed meal, (2) equal parts of ground kafir and cottonseed meal, (3) cottonseed meal alone (full-fed), and (4) cottonseed meal alone (limited for 84 days and full-fed 84 days).

The average daily gains per steer were 2.17, 2.33, 2.41, and 2 lb. At prevailing prices the cost of feed per 100 lb. gain was $10.54, $9.96, $9.61, and $10.37, and profit per head was $4.92, $6.11, $8.08, and —$2, for lots 1 to 4, respectively. The lot fed liberal amounts of cottonseed meal did not develop symptoms of cottonseed meal poisoning in either of two similar trials. Choice fat cattle were produced by the use of all of these rations. In a previous trial with higher priced concentrates and lower priced roughages, lot 4 steers made cheaper gains than those fed liberal amounts of concentrates.

Producing and finishing beef calves, G. A. Brown, G. A. Branaman, and G. J. Propp (*Michigan Sta. Quart. Bul., 21 (1938), No. 1, pp. 35–37*).—The results of 1 year's study on the cost of handling 10 cows and the finishing of their calves for beef production are presented. The average feed cost per cow was $24.74. One-half of the calves creep-fed grain after 3 mo. of age and full-fed grain in the finishing pen were marketed at 332 days of age at a total feed cost of $6.66 per 100 lb. of beef. The other calves, which received no grain on pasture and were fed largely on corn silage and hay until near the end of the feeding period, were marketed at 463 days of age at a total feed cost of $6.57 per 100 lb. of beef produced. Since there was no significant difference in feed cost per unit of beef produced by the two methods, it is concluded that the comparative quantities of concentrates and roughage available, the average market prices in spring and in fall, and the sex of the calves (heifers finished more rapidly than steers) should largely determine the feeding practice to be followed.

Fattening range calves in feedlot, W. F. Dickson (*Montana Sta. Bul. 359 (1938), pp. 22*).—The results of a series of fattening trials with calves to determine the efficiency of wheat and alfalfa or barley and alfalfa as basic fattening rations and the value of various feeds, including cottonseed cake, wheat bran, dried beet pulp, beet molasses, and inorganic phosphorus compounds, as supplements to these basic rations are summarized.

Alfalfa with either wheat or barley gave satisfactory gains and profitable returns, although the relative efficiency of the two grains was not directly compared. The addition of cottonseed cake did not improve the wheat-alfalfa ration, but did increase the rate of gain, the market value of the calves, and the net returns when added to the barley-alfalfa ration. Barley could be satisfactorily substituted for one-half the wheat when fed with alfalfa and cottonseed cake. Dried beet pulp did not replace an equal weight of grain in any of the trials. No advantage resulted from adding beet molasses to a ration of wheat, cottonseed cake, and alfalfa. The use of oats to replace wheat or barley for starting calves on feed was not effective in preventing bloat.

The sheep flock, L. H. Blakeslee, J. G. Wells, Jr., and G. A. Brown (*Michigan Sta. Quart. Bul., 21 (1938), No. 1, pp. 38–40*).—Purebred Hampshires,

½-blood Lincoln ewes × Black Top rams, and ½-blood Black Top ewes × Lincoln rams produced 114, 111, and 110 weaned lambs per 100 ewes, with average weaning weights of 72.5, 68.5, and 75.6 lb., respectively. Average fleece weights were 6.5 and 9.65 lb., of which 82 and 97 percent were of combing length for the Hampshires and cross-breds, respectively.

Experiments in the fattening of lambs, J. P. Willman and F. B. Morrison (*[New York] Cornell Sta. Bul. 691 (1938), pp. 28, figs. 2*).—The results of three series of lamb feeding trials, each involving seven lots of western feeder lambs, are summarized. The average results for lots 1, 3, and 2 receiving shelled corn and alfalfa hay; corn, alfalfa, and bonemeal; and corn, alfalfa, and protein supplement, respectively, indicated that neither supplement appreciably increased the rate of gain nor decreased the feed required per unit of gain over the unsupplemented ration, but that both tended to improve the finish and increase the market value of the lambs. The net returns per lamb over feed costs were 71, 91, and 86 ct., respectively. The average results from lots 1, 4, and 5 receiving corn and alfalfa; corn, protein supplement, alfalfa hay, and corn silage; and corn, protein supplement, calcium supplement, and corn silage, respectively, showed average daily gains of 0.35, 0.4, and 0.36 lb. and average net returns over feed costs of 71 ct., $1.24, and 98 ct., respectively. Corn silage proved entirely satisfactory as a sole roughage but had a higher value when fed with alfalfa hay. A comparison of lots 2 and 6 which were allowed outdoor exercise and constantly confined, respectively, showed that the latter group required less feed per unit of gain and returned more net profit per lamb than the former. A comparison of lot 7, which received a very low protein ration, with lot 1 on corn and alfalfa showed that the low protein group made unsatisfactory gains, was frequently off feed, and was unfinished and unthrifty at the end of the trial.

Shrinkage and dressing yields of hogs, K. Bjorka (*U. S. Dept. Agr., Tech. Bul. 621 (1938), pp. 22, figs. 7*).—The data reported cover over 6 million hogs, about one-third of which were bought direct and two-thirds bought at public markets, and were supplied by a number of cooperating packing plants located in the East and Middle West.

Shrinkage of hogs in transit resulted both from excretions and from loss in weight of tissue. Tissue shrinkage began early in the period in transit and continued until the place of slaughter was reached. It occurred at a fairly constant rate during the early part of transit and continued at a lower rate as time in transit was prolonged. Supplying feed and water en route did not prevent such losses. Excretory shrinkage occurred at a rapid rate during the early part of the transit period and at a slower rate as time in transit increased, reaching its maximum after from 30 to 36 hr. Both types of shrinkage were less in heavy than in lightweight hogs.

Dressing yields based on "purchased weights" decreased as the period in transit increased due to tissue shrinkage. Dressing percentages average higher for heavy than for lightweight hogs. Shrinkage was less and dressing yields computed on purchased weights were larger during the winter than during the summer.

The nutrition and feeding of dogs [trans. title], E. Mangold (*Kleintier u. Pelztier, 14 (1938), No. 4, pp. VII+194, figs. 70*).—The principal topics of discussion in this monograph include the digestive and metabolic processes of the dog, various foodstuffs used in the dog ration, the digestion and utilization of feeds, and light as a factor in nutrition.

Improving poultry through the National Poultry Improvement Plan, P. B. Zumbro, M. W. Buster, and J. D. Sykes (*U. S. Dept. Agr., Misc. Pub. 317*

(1938), pp. II+9, figs. 11).—Further information is presented regarding the National Poultry Improvement Plan (E. S. R., 79, p. 91), including an explanation of the plan of administration; the labels, designs, and terminology employed; the various classes provided for: and who may participate and who will benefit by the plan.

The essential nature of arginine in the diet of the chick, A. A. Klose, E. L. R. Stokstad, and H. J. Almquist. (Univ. Calif.). (*Jour. Biol. Chem., 123 (1938), No. 3, pp. 691–698, figs. 2).*—Experiments were designed to test the indispensability of tryptophan, histidine, and arginine for chicks with diets which were very low in these amino acids and to determine the adequacy of whole casein as a source of arginine. Each of these amino acids was found to be essential for the chick.

The chick was unable to synthesize sufficient arginine for maintenance since ornithine, urea, or a combination of the two could not replace arginine in the diet. Diets containing 20 percent casein did not supply adequate arginine for normal growth, although the total amount of arginine in the casein exceeded the amount of a purified arginine salt required for maximum growth. An arginine-supplemented diet containing 20 per cent casein supported better growth than one containing 30 percent casein with or without supplements. Favorably supplemented acid-hydrolyzed casein diets were inferior to unhydrolyzed casein mixtures.

The quantitative requirement of the growing chick for manganese, W. M. Insko, Jr., M. Lyons, and J. H. Martin. (Ky. Expt. Sta.). (*Jour. Nutr., 15 (1938), No. 6, pp. 621–627).*—In experiments to determine the level of manganese most satisfactory for growth and for the prevention of perosis in chicks, an all-mash ration containing 6 or 7 p. p. m. of manganese was supplemented with various levels of manganese sulfate.

The addition of at least 30 p. p. m. of manganese to the basal ration was necessary for good growth and for the prevention of slipped tendons. A relatively high incidence of perosis occurred at lower levels, and the degree of bowing of the legs was inversely proportional to the manganese content of the feed up to about 30 p. p. m. A maximum level of 646 p. p. m. did not prove toxic.

Studies in the nutrition of the chick.—III, A maintenance factor present in wheat germ and the effect of the addition of a small amount of manganese dioxide to the diet, R. van der Hoorn, H. D. Branion, and W. R. Graham, Jr. (*Poultry Sci., 17 (1938), No. 3, pp. 185–192, figs. 2).*—Continuing these studies (E. S. R., 74, p. 383), chicks were fed a series of simplified diets consisting mainly of cornstarch, purified casein, yeast, cod-liver oil, and a salt mixture. When supplements of a wheat germ extract and manganese were added to these diets a high percentage of chicks survived. However, feeding manganese in the absence of wheat germ extract resulted in complete nutritional failure and wheat germ in the absence of manganese resulted in a high mortality, indicating that each provided a separate and distinct maintenance factor required by the growing chick. Evidence that manganese was involved in the perosis problem is also presented.

Effect of certain nutritional deficiencies on various phosphorus-containing fractions of the chick brain, R. W. Engel and P. H. Phillips. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 3, pp. 553–556).*—Chicks suffering from acute vitamin A deficiency, vitamin B_4 deficiency, or nutritional encephalomalacia were sacrificed at 10–21 days of age. and various fractions of their brain, namely, the alcohol extract, the trichloracetic acid extract, and the remaining fraction, were analyzed for phosphorus content.

The ester phosphorus of the trichloracetic acid extract was markedly reduced in the deficiency diseases, while the inorganic phosphorus was increased, though not to the same extent that the former was reduced. The phosphorus in the alcohol extract fraction was slightly increased but was unaffected in the residual fraction. Apparently these nutritional deficiencies caused a disturbance of the normal phosphorus metabolism of the brain.

Vitamin A deficiency and semen production in chickens, W. H. Burrows and H. W. Titus. (U. S. D. A.). (*Poultry Sci., 17 (1938), No. 3, pp. 224–226, fig. 1*).—Two groups of 11 cross-bred cockerels each were fed vitamin A-deficient and vitamin A-sufficient diets, respectively, from 7.5 to 12 mo. of age. Semen production, as measured by frequent artificial collection, was somewhat greater on the deficient diet, suggesting that cod-liver oil, which supplied the major portion of vitamin A in the adequate diet, depressed rather than stimulated the production of semen. Insemination tests showed that the semen from both groups was potent.

The antirachitic activity of various forms of vitamin D in the chick, D. G. Remp and I. H. Marshall (*Jour. Nutr., 15 (1938), No. 6, pp. 525–537, fig. 1*).—Five vitamin D preparations, including cod-liver oil, crystalline irradiated ergosterol (vitamin D_2), crystalline irradiated 7-dehydrocholesterol (vitamin D_3), irradiated crude spinal-cord cholesterol in oil, and viosterol (A. R. P. I. process) in oil, all of which were assayed in triplicate on rats, were tested for their prophylactic values against rachitis in chicks. The crystalline preparations of vitamins D_2 and D_3 were identical in antirachitic potency per gram on rats.

The minimal protective daily dose for chicks fed a rachitogenic diet was found to be 2.5 International Units of cod-liver oil, 2.5 of vitamin D_3, 2.7 of irradiated cholesterol, 120 of viosterol, and 85 I. U. of vitamin D_2. Rat unit for rat unit the effective ratio of cod-liver oil to viosterol in the chick was 1:48 and of vitamin D_3 to vitamin D_2 was 1:34. The reasons for the variations in vitamin D potency of the preparations when tested on rats and chicks are discussed.

The inactivity of nicotinic acid in chick dermatitis, O. Mickelsen, H. A. Waisman, and C. A. Elvehjem. (Univ. Wis.). (*Jour. Biol. Chem., 124 (1938), No. 1, pp. 313–320*).—Chicks fed on a heated ration of natural grains and casein fortified with adequate amounts of vitamins A, B_1, D, riboflavine, and the antihemorrhagic factor consistently developed severe dermatitic symptoms. Feeding pure nicotinic acid in amounts ranging from 50 to 5,000 μg daily or 100 μg of nicotinic acid amide, or the subcutaneous injection of 300 μg of nicotinic acid daily failed to alleviate these symptoms. When 4 percent of dried whole liver was added to the ration chicks immediately gained in weight and showed a rapid healing of the dermatitis. It is suggested that this essential factor contained in liver and which is distinct from vitamin B_1, vitamin B_2, flavine, nicotinic acid, or factor W be termed the chick antidermatitis factor.

Influence of bile acids on erosions of the chick gizzard lining, H. J. Almquist. (Univ. Calif.). (*Science, 87 (1938), No. 2267, p. 538*).—A series of experiments on the role of the bile acids in this deficiency disease is briefly reported. The feeding of whole bile, commercial dried bile tablets, vacuum concentrated bile, cholic acid, deoxycholic acid, sodium glycocholate, and sodium taurocholate as supplements to a deficient basal diet resulted in marked protective action against the development of gizzard lesions, indicating that bile may play a definite role in the maintenance of a normal gizzard lining. Bile proved a very poor source of vitamin K and the feeding of large doses of vitamin K did not diminish the incidence of gizzard erosion, indicating a distinct differentiation of gizzard erosions from the vitamin K deficiency syndrome. The identity of the chick gizzard factor with any component of bile was not established in these studies.

Heat production and gaseous metabolism of young male chickens, H. G. Barott, J. C. Fritz, E. M. Pringle, and H. W. Titus. (U. S. D. A.). (*Jour. Nutr., 15 (1938), No. 2, pp. 145–167, figs. 8*).—The results of a series of energy and gaseous metabolism determinations, each of 72 hours' duration, on male Rhode Island Red chickens between the ages of 4 and 133 days are reported. Standard calorimeter conditions of 90° F., 60 percent relative humidity, 21 percent oxygen, and not more than 1 percent carbon dioxide were maintained. The basal energy metabolism per gram of live weight (after 66 hours' fasting) was greatest at about 15 days of age or 70 g weight. Beyond this stage it declined at a rapid rate, becoming relatively constant at about 100 days of age or 980 g weight. The basal respiratory quotient was nearly the same for all chicks within this age range, averaging 0.719±0.004. Total water elimination was quite constant at all ages, averaging 2.8±0.1 mg per hour per gram at the basal level and 3.1±0.1 mg per hour per gram 6 to 14 hr. after feeding. The thermal equivalent of oxygen was 4.653±0.031 kg-calories per liter 10 hr. after feeding and 4.377±0.039 at the basal level. In very young chicks the maximum resting metabolism after ingestion of feed was about 60 percent above the basal level, whereas at 16 to 20 weeks it was only about 25 percent greater. Maximum energy metabolism occurred about 8 a. m. and a minimum about 8 p. m., this diurnal rhythm decreasing rapidly with age. Feeding casein or gelatin during these tests gave evidence that their specific dynamic action was about 9.7 and 8.7 kg-calories per gram of nitrogen, respectively.

The time factor in egg production, B W. Heywang. (U. S. D. A.). (*Poultry Sci., 17 (1938), No. 3, pp. 240–247*).—Analyses of time of egg production records of groups of Rhode Island Red and White Leghorn pullets in their first and second laying years, confined in open pens and in small individual laying batteries, and fed ad libitum and at restricted levels gave evidence that age, restricted diet, or close confinement did not affect the mean time interval between successive eggs. There was a significant difference between the breeds, the mean time interval being 27.69 and 28.21 hr. for 2-egg cycles, 26.56 and 26.97 for 3-egg cycles, and 25.86 and 28.16 for 4-egg cycles for the Rhode Island Reds and White Leghorns, respectively. It appeared that a highly irregular time sequence between successive eggs may occur occasionally.

The measurement of egg weight, F. P. Jeffrey. (N. J. Expt. Stas.). (*Poultry Sci., 17 (1938), No. 3, pp. 179–184*).—In a study to determine which of several egg weight measurements was best suited for the use of investigators of egg weight inheritance and the practical poultry breeder, dam-daughter correlations were determined for each of 14 measures of pullet year egg weight and of the mean second year egg weight, using only records of March to May hatched birds. The mean weight of the first 10 eggs in March was statistically superior to any measure taken before the birds reached body size maturity, but not superior to mean annual egg weight. Theoretical objections to the use of the mean annual egg weight and points favoring the use of the mean weight for the first 10 eggs in March are advanced.

Calcium content of the yolk of fresh and storage eggs, S. E. Erikson, R. E. Boyden, J. H. Martin, and W. M. Insko, Jr. (*Kentucky Sta. Bul. 382 (1938), pp. 113–124*).—Continuing this line of investigation (E. S. R., 79, p. 380), the calcium content was determined in the yolks of eggs (fresh and after 12 months' storage) produced under controlled conditions to test the effect of feeding cod-liver oil and allowing hens access to sunshine and bluegrass range, singly and in combination. Any one of the vitamin D supplements tended to increase the calcium content in the fresh yolks, although bluegrass range and sunshine was no more effective than sunshine alone either with or without cod-liver oil. The calcium in the yolks of storage eggs was consistently higher than in fresh eggs produced under comparable conditions.

On the nature of "meat spots" in eggs, B. R. BURMESTER and L. E. CARD. (Univ. Ill.) (*Poultry Sci., 17 (1938), No. 3, pp. 235–239, figs. 3*).—The location and the gross and microscopic appearance of 68 meat spots obtained from eggs are described. Of these, about 71 percent were located in the thick white, 14 percent in the chalazae, 6 percent in the inner thin white, and 4 percent each in the outer thin white and on the yolk surface, and 81 percent showed signs of red or brown color. It appeared that extravascular blood was directly involved in the formation of such meat spots, most of them consisting of a central mass of red blood corpuscles surrounded by a protein layer of varying thickness. There was great variation in the extent of red cell degeneration in the specimens observed. The probable cause of this phenomenon is discussed.

Biochemistry and biophysics of the developing hen's egg.—III, Influence of temperature, A. L. ROMANOFF, L. L. SMITH, and R. A. SULLIVAN ([*New York*] *Cornell Sta. Mem. 216 (1938), pp. 42, figs. 18*).—Continuing this line of investigation (E. S. R., 70, p. 819), the effect of exposure of eggs to various temperatures at successive stages of embryonic development was studied by using long or weekly exposures and short or 24-hr. exposures to ranges in temperature at various stages of incubation. All other physical features of incubation, except temperature, were held constant throughout. An extensive bibliography is appended.

During the early stages of incubation embryonic growth was greatly stimulated by high temperature and retarded by low temperature. Thermal effect lessened with advance of incubation, and after 10 days both high and low temperatures slightly retarded growth. After short (24 hr.) exposures to high or low temperature, even in the early stages of incubation, post-exposure growth was eventually slightly retarded. Temperature extremes, either high or low, caused a greater number of defective and abnormal embryos than a temperature range near the normal. The development of the allantois, with its blood vessels and the concentration of uric acid in the allantois, corresponded closely to the growth rate of the embryo. The rate of assimilation of albumin and the disappearance of the free glucose was most rapid at high and slowest at low temperature, indicating that carbohydrate metabolism and growth of the embryo were both favored by slightly raised temperatures during early stages. Embryonic mortality was reduced during early incubation by slightly high temperature and during the latter part of incubation by slightly low temperature. Ruptured yolk sacs and a sticky appearance of the egg were specific symptoms of high and low temperatures, respectively. The hemorrhagic condition and various malpositions of the embryo were not specific, occurring under both extremes. Low temperature markedly increased and high temperature slightly decreased the length of the incubation period. The effect of exposure to extremes lessened with the advance of the incubation period.

Effect of different incubation temperatures on mortality of chick embryos, T. C. BYERLY. (U. S. D. A.). (*Poultry Sci., 17 (1938), No. 3, pp. 200–205, fig. 1*).—Eggs used in this study were produced by pullets from a cross of Leghorn males by cross-bred pullets (Rhode Island Red male × Barred Rock female). A total of 18,665 fertile eggs were incubated at temperatures of 97°, 99.75°, and 102.5° F. (ratio approximately 1:2:1). Hatchability of fertile eggs at these temperatures was 49.4, 85.3, and 24.3, respectively. Greatest mortality occurred in the 97° group at morphological stages corresponding to 6–7 and 19–21 days at normal incubation temperatures, while mortality in the 102.5° group was excessive at stages corresponding to 13–15 and 18–21 days of normal development. Observations on malpositions showed a high incidence of head-in-small-end-of-egg at both high and low temperatures and a high incidence of head-under-left-wing and head-between-legs at the higher temperatures. The relative survival in inherently weak and inherently strong embryos was not materially influenced by the use of abnormal incubation temperatures.

Confinement versus open range for Bronze turkey breeders, T. B. Charles, P. A. Wilcox, D. W. Flagg, and A. E. Tepper *(Poultry Sci., 17 (1938), No. 3, pp. 248–252; also New Hampshire Sta. Sci. Contrib. 65 (1938), pp. 248–252).*—A comparison of the feed consumption, weight, and mortality, and the production, size, fertility, and hatchability of eggs of groups of Bronze turkeys, one of which was maintained in complete confinement and the other on open range, gave evidence that confinement of turkey breeders offers certain commercial advantages. No significant differences in egg size, maintenance of body weight, or hatchability of eggs were apparent, and the slightly greater feed consumption of confined birds was more than offset by materially greater egg production.

Turkey feeding experiments, 1933–1937, F. B. Headley and E. W. Knight. (Coop. U. S. D. A.). *(Nevada Sta. Bul. 148 (1938), pp. 30, figs. 10).*—This series of experiments was designed to study the effect of various levels of protein, fat, and ash and different ratios of animal and vegetable protein in rations on the rate of growth and development of young turkeys. The growth rate of young toms increased with increasing protein content of the ration up to 24 percent, while beyond this point there was a slight decrease. Young hens were less affected by changing protein levels than toms. Young hens made as good growth when started at 8 weeks of age on an 18.4-percent protein ration but did not finish as well as those receiving higher levels of protein, while toms started at this level did not grow so rapidly nor finish as well as at higher levels. With both sexes, growth rate and finish rate were as good when the protein content was reduced from 23.3 percent to 18.4 percent at 16 weeks of age and further reduced to 13.6 percent at 22 weeks of age as when the higher level was continued throughout the feeding period.

A high ash content of the ration which accompanied high protein levels resulted in numerous cases of crooked breasts and slipped tendons. Slipped tendons frequently occurred in young toms receiving over 10 percent of ash.

After poults were 8 weeks of age an animal protein: vegetable protein ratio of about 1:3 gave as good results as when a higher proportion of animal protein was fed. The animal protein could be further reduced after 16 weeks of age.

A marked relationship between initial weight of poults and finished weight was observed.

Nutritional myopathy of the gizzard in turkeys, E. Jungherr and A. M. Pappenheimer. ([Conn.] Storrs Expt. Sta. et al.). *(Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 3, pp. 520–526, figs. 5).*—When a simplified diet which produced a nutritional encephalomalacia in chicks (E. S. R., 76, p. 232) was fed to young turkey poults, a selective necrosis of the smooth muscle of the gizzard wall, unaccompanied by significant lesions in other organs, resulted, thus constituting a previously unrecognized nutritional disorder of turkeys. These alterations, which are described in detail, illustrate the fact that different species of animals may react in quite diverse fashion to the same abnormal diet.

The vitamin G requirements of young poults, T. H. Jukes. (Univ. Calif.). (*Poultry Sci., 17 (1938), No. 3, pp. 227–234, fig. 1*).—These studies dealt with the amounts of the filtrate factor and riboflavine required by young poults. Feeding a basal diet of unheated natural feeding stuffs deficient in the filtrate factor resulted in slow growth and high mortality of poults. Adding filtrate factor concentrates prepared from rice bran, liver, or whey markedly improved the growth rate and livability. The requirement for maximal growth was about 1 unit of filtrate factor per gram of ration, or very similar to the amount required by chicks. Mortality of poults may be higher than in chicks on diets deficient in this vitamin. Feeding poults a flavine-deficient diet similar to that used in trials with chicks (E. S. R., 77, p. 81) resulted in slow growth and development of dermatitis in about 2 weeks, often shortly followed by death. No "curled toe" paralysis as developed by chicks on flavine-deficient diets was observed in these trials. The addition to the basal diet of 1.4 percent of a whey adsorbate containing about 60 modified Bourquin-Sherman units of vitamin G per gram was sufficient to support maximal early growth of the poults. With a different basal diet the addition of 8 percent of dried skim milk (supplying about 11 units of vitamin G per gram) prevented dermatitis and supported as good growth as when 12 percent of dried skim milk was added, but slower growth than was obtained by using 3 percent of dried liver. It appeared that the riboflavine requirement of poults per unit weight of ration was similar to that of chicks of early growth, and that liver contained a growth factor for poults other than the filtrate factor or riboflavine.

Incubation conditions and hatchability of turkey eggs, T. C. Byerly, S. K. Haynes, and S. J. Marsden. (U. S. D. A.). (*Poultry Sci., 17 (1938), No. 3, pp. 253–256, fig. 1*).—The various combinations of incubation factors studied included incubation temperatures of 99.75° or 97° F., 45° angle or horizontal position of eggs, and turned three times daily or unturned. In each of 7 incubations, one lot of eggs was transferred from the control incubation conditions to experimental conditions at 12, 15, 18, 21, 24, and 25 days' incubation, respectively. Eggs turned fewer than 24 days averaged 4.4 percent lower in hatchability than the turned controls, which was statistically significant. Longer eggs were more adversely affected by lack of turning than shorter eggs. The differences in hatchability due to temperature or position were of small significance under the conditions of these experiments. Temperatures of 93°, 95°, 97°, 98.5°, and 99.75° for the 25–28 days of incubation gave similar hatchability results, but a temperature of 102° for this period markedly reduced hatchability.

DAIRY FARMING—DAIRYING

[Abstracts of papers presented at the 33rd annual meeting of the American Dairy Science Association] (*Jour. Dairy Sci., 21 (1938), No. 5, pp. 97–117, 121, 122–126, 128, 129, 132, 136, 140–165, 166, 167, 168–173*).—Following are listed the titles and authors of papers pertaining either to dairy production or dairy manufacturing, presented at the annual meeting of the association (E. S. R., 78, p. 93) held at Columbus and Wooster, Ohio, June 1938: New Facts In Nutrition Applied to Dairy Cattle, by C. F. Huffman (pp. 97, 98) (Mich. State Col.); Vitamin E and Reproduction in Herbivora, by B. H. Thomas, C. Y. Cannon, S. H. McNutt, and G. Underbjerg (pp. 98, 99) (Iowa State Col.); Relation of Nutrition to the Hormones, by C. W. Turner (pp. 99, 100) (Mo. Expt. Sta.); Effect of Fertilizer Treatments on Nutrients Produced by Pastures, by R. A. Ackerman and H. O. Henderson (pp. 100, 101) (W. Va.); A Method of Studying the Deficiencies of Alfalfa Hay and the Feeding Value of Various

Feeds as Supplements to Alfalfa Hay, by C. F. Huffman (pp. 101, 102) (Mich. State Col.); Air Dried Hay for Dairy Heifers, by C. E. Wylie, S. A. Hinton, and J. W. Weaver, Jr. (pp. 102, 103) (Univ. Tenn.); The Influence of Certain Rations and Management Practices on the Rate of Growth of Holstein Friesian Heifers, by R. G. McCarty and A. C. Ragsdale (pp. 103, 104) (Mo.); The Comparative Nutritive Value of Sun Cured Pea Vines, Artificially Dried Pea Vines, and Pea Vine Silage, by J. C. Knott, R. E. Hodgson, and E. V. Ellington (p. 104) (Wash. State Col. coop. U. S. D. A.); Experience in Ensiling Partially Cured Alfalfa, Methods Used, Losses Sustained, and Feeding Value, by J. B. Shepherd and T. E. Woodward (pp. 104, 105) (U. S. D. A.); Methods of Making and Feeding Alfalfa Molasses Silage, by B. R. Churchill and R. E. Horwood (pp. 105, 106) (Mich. State Col.); The Influence of the Quality of Protein in the Concentrate Mixture on the Production of Dairy Cows Fed Mixed Hay and Corn Silage, by G. W. Salisbury and F. B. Morrison (pp. 106, 107) (Cornell Univ.); The Influence of Fineness of Grinding on the Coefficients of Digestion on Dairy Cows, by T. M. Olson and G. C. Wallis (pp. 107, 108) (S. Dak. State Col.); The Relation of Certain Succulent Roughages to the Color and Flavor of Milk, by H. H. Tucker, O. F. Garrett, and C. B. Bender (pp. 108, 109) (N. J.); The Effect of the Level of Feeding Dairy Cows Upon the Flavor of Their Milk, by J. C. Hening and A. C. Dahlberg (p. 109) (N. Y. State); A Study of Some of the Physico-chemical Effects of Soybeans on the Fat in Cows Milk, by R. W. Bratton, W. F. Epple, J. W. Wilbur, and J. H. Hilton (pp. 109, 110) (Purdue Univ.); The Vitamin D Content of the Milk Produced by Jersey and Holstein Cattle Receiving the Same Vitamin D Intake, by G. C. Wallis (p. 111) (S. Dak. State Col.); Plasma Magnesium Studies on the Growing Bovine, by C. W. Duncan and C. F. Huffman (pp. 111, 112) (Mich. State Col.); The Normal Concentration of Inorganic Phosphorus in the Blood of Lactating Dairy Cows and Factors Affecting It, by A. H. VanLandingham, H. O. Henderson, and G. A Bowling (pp 112, 113) (W. Va.); The Carotene Content of Market Hays and Corn Silage as Determined by a Quantitative Adsorption Procedure, by L. A. Shinn, H. G. Wiseman, E. A. Kane, and C. A. Cary (pp. 113, 114) (U. S. D. A.); Relationship Between Carotene, Blindness Due to Construction of the Optic Nerve, Papillary Edema, and Night Blindness in Calves, by L. A. Moore (p. 114) (Mich.); The Carotene Requirements for Normal Reproduction, by H. T. Converse and E. B. Meigs (pp. 114, 115) (U. S. D. A.); Vitamin A for Growth and Reproduction in Dairy Heifers, by I. R. Jones and J. R. Haag (pp. 115, 116) (Oreg. State Col); The Value of Dried Molasses and Yeast for Dairy Calves, by O. L. Lepard, P. E. Newman, and E. S. Savage (pp. 116, 117) (Cornell Univ.); Vitamin C Metabolism in the Dairy Cow, by W. H. Riddell and C. H. Whitnah (p. 121) (Kans.); Enzymatic Relationship to the Synthesis of Milk Fat, by P. L. Kelly (pp. 122, 123) (Univ. Ark.); The Effect of Fasting and Refeeding on Milk Secretion in the Cow and Goat and the Course of Fasting Energy Production Curves in the Lactating and Dry Dairy Cow Under Similar Environmental Conditions, both by L. E. Washburn (p. 123) (Mo.); Nature of Swelling in the Cow's Udder at Calving Time, by W. W. Sweet, C. A. Matthews, and R. R. Graves (pp. 123, 124) (U. S. D. A.); Some Factors Affecting the Resistance of Animals to Mastitis, by L. A. Burkey, E. B. Meigs, G. P. Sanders, and M. Rogosa (pp. 124, 125) (U. S. D. A.); Preventing Sudan Grass Poisoning, by F. Boyd, O. S. Aamodt, G. Bohstedt, and E. Truog (pp. 125, 126) (Univ. Wis.); Age and Its Influence on Culling and Life Expectancy in Dairy Cows, by D. M. Seath and J. L. Lush (pp. 128, 129) (Kans. and Iowa State Cols.); Relation Between Rate of Growth and Milk and Fat Production, by H. P. Davis and E. L. Willett (p. 132) (Univ. Nebr.); A Method for Preventing Onion Flavor in

Milk, by C. E. Wylie (p. 136) (Univ. Tenn.); Some Factors Affecting the Estimation of Fat in Milk by the Babcock Method, by W. A. Caldwell and E. O. Herreid (pp. 140, 141) (Vt.); The Cause and Prevention of the Decrease in Fat Test of Composite Samples, by R. F. Holland (p. 141) (Cornell Univ.); A Study of the Resazurin Test as Applied to Cream, by H. Jenkins (pp. 141, 142); Studies of Lipase Action in Milk, by V. N. Krukovsky and B. L. Herrington (pp. 142, 143) (Cornell Univ.); Observations on the Lipase Activity in Cow's Milk, by J. C. Pfeffer, H. C. Jackson, and K. G. Weckel (p. 143) (Univ. Wis.); Detecting Milk That May Become Oxidized (pp. 143, 144) and The Relation of Oxidation-Reduction Potential to Oxidized Flavor in Milk (p. 144), both by G. R. Greenbank (U. S. D. A.); A Study of the Relation of Titratable Acidity to Metal-Developed Oxidized Flavor in Milk, by W. C. Brown and R. B. Dustman (pp. 144, 145) (W. Va.); Studies on the Activated Flavor of Milk, by J. C. Flake, H. C. Jackson, and K. G. Weckel (pp. 145, 146) (Univ. Wis.); Variation in the Composition of Milk and the Effect on Solids-Not-Fat, by H. A. Herman (pp. 146, 147) (Mo.): Studies on the Mold Mycelia Content of Sour Cream Butter, by J. Adams and E. H. Parfitt (pp. 147, 148) (Purdue Univ.); The Effect of Temperature Upon Score Value and Physical Structure of Butter, by W. H. E. Reid and W. S. Arbuckle (p. 148) (Mo.); Application of the Burri Smear Culture Technic to the Examination of Butter, by H. F. Long and B. W. Hammer (pp. 148, 149) (Iowa); The Application of the Phosphatase Test to the Butter Industry, by W. H. Brown and E. H. Parfitt (p. 149) (Purdue Univ.); Preliminary Studies of the Neutralization of Cream for Buttermaking, by R. C. Townley and I. A. Gould (p. 150) (Mich. State Col.); The Relation of Milk Quality to Grade of Swiss Cheese, by L. A. Rogers, R. E. Hardell, and F. Feutz (p. 151) (U. S. D. A. Coop. Ohio State Univ. and Univ. Wis.); Clarification of Milk for the Manufacture of Swiss Cheese, With Special Reference to the Use of Mastitis Milk, by K. J. Matheson, G. P. Sanders, L. A. Burkey, and J. F. Cone (pp. 151, 152) (U. S. D. A.); Control of Types of Organisms in High Temperature Starters, by D. Nusbaum and W. V. Price (pp. 152, 153) (Univ. Wis.); Methods of Determining Chlorine in Milk and Their Application in the Detection of Mastitis, by G. P. Sanders (pp. 153, 154) (U. S. D. A.); Controlling the Fat Content of Swiss Cheese in Southern Wisconsin, by W. V. Price (p. 154) (Univ. Wis.); Sodium per Borate as a Corrosion Inhibitor for Washing Powders, by L. L. Little (pp. 154, 155); Sterilization by Irradiation—A Possible New Tool for the Dairy Industry, by O. F. Garrett and R. B. Arnold (p. 155) (N. J.); Kefir Buttermilk, by L. A. Burkey (pp. 155, 156) (U. S. D. A.); The Present Status of the Development of Fiber From Casein, by E. O. Whittier (p. 156) (U. S. D. A.); Whey Solids in Candy, by B. H. Webb (p. 156) (U. S. D. A.); Effect of the Cold Storage Temperature, Pasteurization Treatment, and Homogenization Pressure on the Properties of Frozen Condensed Milk, by R. W. Bell (pp. 156, 157) (U. S. D. A.); Consumer Preference as Related to the Analysis of Vanilla Ice Cream in Tennessee, by T. B. Harrison, H. B. Henderson, and C. E. Wylie (p. 157) (Univ. Tenn.); The Use of Moving Pictures in Ice Cream Investigations, by W. H. Reid, W. S. Arbuckle, and R. J. Drew (pp. 157, 158) (Mo.); Application of the Phosphatase Test to Determine the Efficiency of Pasteurization of Ice Cream Mix, by A. J. Hahn and P. H. Tracy (p. 158) (Univ. Ill.); Influence of Certain Mix Components Upon the Rate at Which Freezing Occurs in Ice Cream as Measured by the Dilatometer Method, by W. C. Cole and J. H. Boulware (p. 159) (Univ. Calif.); A Study of Quality Variations in Summer and Winter Made Cheese, by J. C. Marquardt (pp. 159, 160) (N. Y. State); Starters Used in Wisconsin Brick Cheese Factories, by W. L. Langhaus and P. R. Elliker (p. 160) (Univ. Wis.); Methods Which Help to Retain Fat in American Cheddar Cheese at High Temperatures, by H. L. Wilson (pp. 160, 161) (U. S. D. A.); X-ray Diffraction Analysis of White Specks in Cheddar Cheese, by S. L. Tuckey, H. A. Ruehe, and G. L. Clark (p. 161) (Univ. Ill.); Studies on the Ripening of Blue Cheese, by C. B. Lane and B. W. Hammer (pp. 161, 162) (Iowa); Studies on the Vitamin A Content of Cheese, by I. L. Hathaway and H. P. Davis (p. 162) (Univ. Nebr.); Plant Experience With Sonic Soft Curd Milk, by L. A. Chambers (pp. 162, 163); The Digestibility of Natural and Processed Soft-Curd Milks, by C. C. Flora and F. J. Doan (pp. 163, 164) (Pa. State Col.); The Relationship Between Curd Tension and Curd Size, by L. A. Chambers and I. J. Wolman (p. 164); Artificial Gastric Digestion of Milk, by M. E. Hull (pp. 164, 165); The Relation of Milking Machines to the Incidence of Mastitis, by E. B. Meigs, H. T. Converse, L. A. Burkey, M. Rogosa, and G. P. Sanders (pp. 165, 166) (U. S. D. A.); Sudan Grass Hay vs. Clover Hay for Dairy Cows, by C. E. Wylie and S. A. Hinton (p. 167) (Univ. Tenn.); Relation of Lactic Acid and Glucose of the Blood and Glycogen in the Mammary Gland to Milk Secretion, by W. E. Petersen and J. C. Shaw (p. 168) (Univ. Minn.); The Carotene Requirement of Dairy Calves, by R. E. Ward, S I. Bechdel, and N. B. Guerrant (pp. 168, 169) (Pa. State Col.); Revised United States Standards for Quality of Creamery Butter, by R. C. Potts (pp. 169, 170) (U. S. D. A.); Effect of Temperature and Composition Upon the Physical Properties and Dipping Qualities of Ice Cream, by W. H. E. Reid, R. J. Drew, and W. S. Arbuckle (pp. 170, 171) (Mo.); A Comparative Study of Metal and Glass Petri Dish Covers, by H. Jenkins (p. 171); Summary of Experiment With the Delaval Standardizer, by J. H. Frandsen (p. 172) (Mass. State Col.); Methylene Blue Reduction Time as an Indication of the Suitability of Milk for the Manufacture of Swiss Cheese, by A. B. Erekson, C A. Eckburg, and E. Lee (p. 172); Casein Milk Fat as a Foam Depressant in Casein-Clay Slips, by G. A. Richardson and N. P. Tarassuk (pp. 172, 173) (Univ. Calif.); and The Relationship of Mastitis Milk and Soft-Curd Milk to the Manufacture of Swiss Cheese, by K. J. Matheson, L. A. Burkey, G. P. Sanders, and R. R. Farrar (p. 173) (U. S. D. A.).

[Experiments with dairy cattle and dairy production at the Idaho Station], D. R. Theophilus and R. J. Johnson (*Idaho Sta. Bul. 225 (1938), pp. 38–40, 41–43, 74, 75*).—Progress results are briefly reported on the continuous use of sires proved for ability to transmit high production and acceptable type; the comparative vitamin E requirements of males and females; the effect of a sole alfalfa hay ration on the Reichert-Meissl and iodine values of milk fat; pasture mixtures for dairy cattle; the vitamin A value of butter produced in irrigated regions; plant practices and policies influencing the quality of milk; and factors involved in the control of sticky butter.

[Dairy cattle investigations in North Carolina], C. D. Grinnells, R. E. Stitt, J. L. Moore, L. M. Nixon, W. H. Rankin, R. E. L. Greene, S. C. Clapp, and H. B. Coulter. (Partly coop. U. S. D. A.). (*North Carolina Sta. Rpts. 1936, pp. 41–48; 1937, pp. 63–67*).—Results are briefly reported in both reports on the effect of fertilization on dairy cattle pastures; the value of kudzu, *Lespedeza sericea*, and the annual lespedezas as supplementary pasture crops; the use of the whole peanut plant in dairy rations; and the economy of dairying in combination with a corn-cotton-legume rotation. That for 1936 also notes data on the yield, protein content, digestibility, and feeding value of hays cut at different stages of maturity, and peanut v. soybean hay for milking cows, and that for 1937 on the economy of feeding beet pulp in dairy rations.

[Dairy farming and manufacturing research in Pennsylvania] (*Pennsylvania Sta. Bul. 360 (1938), pp. 27, 42, 43, fig. 1*).—Progress of research is briefly noted on the value of mineral supplements in the dairy ration, the vitamin requirements of calves, preserving milk by concentration and freezing, and the curing of Cheddar and Roquefort cheeses.

The old story of type and production, L. Copeland (*Jour. Dairy Sci., 21 (1938), No. 6, pp. 295–303*).—An analysis of the official production records of all purebred Jersey cows which have been officially classified for type indicates a definite relationship between the conformation of cows and their producing ability and shows that both good conformation and high production can be combined in the same animal. The point is stressed that only by continued selection and breeding for desirable type and high production can the dairy breeds be improved and made more uniform in conformation and producing ability.

List of sires proved in dairy herd improvement associations, 1938 (*U. S. Dept. Agr., Misc. Pub. 315 (1938), pp. 78*).—Supplementing a previous list of proved sires (E. S. R., 78, p. 97), this publication contains the names and summarized record of 992 sires whose records were tabulated between April 1, 1937, and April 1, 1938.

Welcome to Ohio! (*Ohio Sta. Spec. Circ. 50 (1938), pp. 4, fig. 1*).—A guide to the State-owned dairy herds and dairy research centers in Ohio.

Ten years of experimental results on cultivated pastures, T. M. Olson and T. A. Evans (*South Dakota Sta. Bul. 324 (1938), pp. 16, fig. 1*).—Ten years' results on the returns secured from grazing alfalfa, sweetclover, and Sudan grass with milking cows are summarized. The length of the grazing season ranged from 40 to 98 days, with an average of 67.4 for alfalfa; 20 to 109, with an average of 67.8 for sweetclover; and 20 to 89, with an average of 51 days for Sudan grass. These averages are considered abnormally low because of several extremely dry seasons encountered. The average amount of milk and butterfat produced per acre of pasture was 3,669 and 146.7, 3,308 and 135.5, and 2,767 and 110 lb. for sweetclover, alfalfa, and Sudan grass, respectively. In general little trouble was experienced with bloat, with greatest danger occurring when legumes were growing rapidly. Sudan grass was most palatable, followed in order by alfalfa and sweetclover. None of these plants had a deleterious effect on milk flavor when the cows were removed from pasture from 2.5 to 3 hr. before milking.

Early-cut, nitrogen-fertilized timothy hay as compared with alfalfa hay for feeding dairy cows, G. W. Salisbury and F. B. Morrison (*[New York] Cornell Sta. Bul. 694 (1938), pp. 30, figs. 4*).—Data reported on the effect of nitrogen fertilization on the yield and composition of timothy hay showed that for 15 fields an average application of 250 lb. of calcium cyanamide per acre increased the yield over the untreated areas by 1,063 lb. per acre. The fertilized hay averaged 1.39 percent higher in protein content and slightly higher in crude fiber. Maximum yields of protein and good quality hay were secured by cutting timothy in the early bloom stage. Two feeding trials with milking cows were conducted to compare the value of nitrogen-fertilized timothy hay with alfalfa hay. Each was fed in combination with corn silage and concentrates, equal amounts of protein being provided in each ration by varying the concentrate mixture. Under these conditions no significant difference in favor of either ration was observed. The two types of hay were similar in vitamin A and D content, as were the butters produced on the two types of ration.

Some effects of a vitamin D deficiency on mature dairy cows, G. C. Wallis. (S. Dak. State Col.). (*Jour. Dairy Sci., 21 (1938), No. 6, pp. 315–333, figs. 7*).—Detailed case histories are presented for three liberally milking cows and one dry pregnant cow maintained under vitamin D-deficient conditions for a prolonged period. In the case of milking cows the calcium and inorganic phosphorus content of the blood declined markedly, blood calcium reaching about one-half normal level, and phosphorus about one-fifth normal level. The animals became stiff, the knees bent forward, the spine became rigid, and movement was difficult. Balance trials indicated a marked negative balance of calcium and phosphorus under these conditions, while administration of vitamin D caused an immediate change to positive balance with large retentions of these elements. Milk produced under these deficiency conditions consistently contained approximately normal amounts of calcium and phosphorus. Calves produced under these conditions showed visible evidence of rickets, although blood analyses and histological studies indicated a nearly normal condition. Bio-assay of butterfat samples from these cows failed to reveal the presence of any vitamin D. All cows failed to show oestrus and one developed very fragile bones, although it is not shown that these conditions were directly connected with the lack of vitamin D.

The effect of season and feeds on the vitamin D content of milk under South Dakota conditions, G. C. Wallis and T. M. Olson (*South Dakota Sta. Bul. 321 (1938), pp. 11, figs. 3*).—Employing the standard rat assay technic, the vitamin D potency of the milk from six grade Holstein cows at different seasons and under different feeding regimes was determined. A marked seasonal variation was noted. Milk produced in July averaged about 32 International Units of vitamin D per quart, which was approximately four times the amount found in April- or November-produced milk. Cows receiving 20 lb. daily of alfalfa hay (10,000 I. U.) or prairie hay (5,000 I. U.) for 3 mo. produced milk containing 13 and 8.4 I. U. per quart, respectively, while milk from cows receiving beet pulp as a sole roughage was practically devoid of vitamin D potency.

Homogenization as a means of stabilizing the flavor of milk, G. M. Trout and I. A. Gould (*Michigan Sta. Quart. Bul., 21 (1938), No. 1, pp. 21–31*).—Samples of mixed herd milk pasteurized by the holder method and contaminated with varying amounts of copper were homogenized at pressures ranging from 500 to 3,000 lb. Samples were bottled from the homogenizer, cooled to 40° F., and judged for flavor after 48 hr. or more. Pressures of 1,500 to 2,000 lb. had a marked effect in stabilizing the flavor, and 2,500 to 3,000 lb. completely inhibited the development of oxidized flavor when copper was added to milk at the rate of 5 p. p. m. prior to homogenization. However, 3,000 lb. was quite ineffective in this respect when more than 6 p. p. m. were added. A pressure of 3,000 lb. protected against oxidized flavor when 2.5 p. p. m. but not when 5 p. p. m. of copper was added after homogenization. The stabilizing effect of homogenization was effective over a milk fat range of from 2 to 10 percent and also when from 1 to 4 percent of serum solids were added, but was ineffective in protecting the flavor of skim milk. Since the copper contamination of these samples far exceeded that normally encountered in processing milk, homogenization would appear to be effective in stabilizing flavor under practical plant conditions.

Manual for milk testers in New Jersey, L. M. Henderson (*New Jersey Stas. Bul. 647 (1938), pp. 34, figs. 13*).—This supersedes Bulletin 539 (E. S. R., 67, p. 449).

Studies on the keeping quality of butter in cold storage, O. R. Overman, O. F. Garrett, and H. A. Ruehe (*Illinois Sta. Bul. 446 (1938), pp. 45–90, figs. 9*).—In an experiment extending over 5 yr., 36 butters churned from cream of varying quality and acidity and ranging in quality from very good to very poor were scored and analyzed at regular intervals during storage at from 0° to —10° F. The complete data on the butter scores and the physical and chemical constants and oxidation data for the butterfat are appended. The essential conclusions presented have been previously noted (E. S. R., 77, p. 242).

Rate of ripening in Cheddar cheese, T. R. Freeman and C. D. Dahle (*Pennsylvania Sta. Bul. 362 (1938), pp. [2]+20, figs. 8*).—Seventeen lots of milk were made into experimental cheese, including five lots in a variable moisture series and three each for varying acidity, rennet, pepsin, and trypsin. All cheeses were analyzed at frequent intervals up to 12 mo. for bacterial count and type, moisture content, pH, amino nitrogen content, and flavor score.

The numbers of bacteria (total and proteolytic) initially present in the cheese were directly related to the rate of proteolysis in the cheese during ripening but were not related to flavor development in the same cheese.

The range of moisture content employed was of little consequence in influencing the rate of ripening. Cheese ripened at 63° F. showed more rapid proteolysis, reached a maximum flavor score more quickly, and attained as high a maximum flavor score as cheese ripened at 45°.

The occurrence of bitter flavor during aging was favored by a high ripening temperature. Low initial acidity in the cheese was conducive to more rapid proteolysis and slightly inferior flavor in aged cheese but had no effect on the rate of flavor development. Additional amounts of pure rennet and added pepsin or trypsin each increased the rate of proteolysis. The rennet and pepsin each improved the flavor score of the aged product, while trypsin increased the rate at which flavor developed but reduced the maximum flavor score attained.

Studies on the vitamin A content of cheese, I. L. Hathaway and H. P. Davis (*Nebraska Sta. Res. Bul. 103 (1938), pp. 10*).—The vitamin A contents as determined by the rat-growth method and the chemical composition of 22 kinds of cheeses are reported. The estimated number of U. S. P. units of vitamin A per pound of cheese varied from less than 900 to over 19,000 units. In general, the samples of cottage, Neufchatel, and Limberger cheeses had the lowest vitamin A potency.

Sweetened condensed whey: Its manufacture and properties, G. A. Ramsdell and B. H. Webb. (U. S. D. A.). (*Jour. Dairy Sci., 21 (1938), No. 6, pp. 305–314, fig. 1*).—A series of experiments was conducted to determine the feasibility of preserving whey solids with sugar, the optimum quantity of sugar to use, the most satisfactory total solids content of the condensed product, the effect of storage on viscosity, and the value of including butterfat and coagulated whey protein in the concentrated mixture. The most satisfactory procedure by which whey solids could be simply and inexpensively preserved consisted in adding to separated pasteurized whey a quantity of sugar equal to the weight of the whey solids, condensing under vacuum to 76 percent total solids, cooling to 35° C., stirring for at least 3 hr. to produce small lactose crystals, and sealing in airtight containers. This condensed product kept well at room temperature for 3 mo. or longer. A slight darkening in color and small increase in viscosity occurred during storage. The product was readily whipped to an overrun of 200 percent in about 4 min., and the whip was stable for 15 hr. Increasing the whey solids: sugar ratio materially increased the viscosity of the product.

VETERINARY MEDICINE

Seventy-five years of progress in veterinary medicine, J. R. Mohler (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 2, pp. 98–104*).—A contribution presented at the seventy-fifth annual meeting of the American Veterinary Medical Association held at New York in July 1938.

[Work in animal pathology by the Idaho Station] (*Idaho Sta. Bul. 225 (1938), pp. 32, 33, 34, 35–37, 41, 63, 64*).—The work of the year reported upon (E. S. R., 77, p. 848) relates to the transmission of fowl paralysis (lymphomatosis), by C. W. Hickman; tuberculosis in poultry, control of pullorum disease, and the etiology of mastitis, all by W. V. Halversen; the testing of sulfanilamide for the control of streptococcic mastitis, by Hickman, Halversen, and D. R. Theophilus; the reduction but not the elimination of the spread of mastitis in dairy cows by segregation, by Theophilus; and specific resistance as a factor in control of fowl paralysis, by C. E. Lampman.

Report of chief veterinary inspector, A. Knight (*Brit. Columbia Dept. Agr. Ann. Rpt., 31 (1936), pp. 61–63*).—A brief report of the progress of work with diseases of livestock in British Columbia in 1936.

Allergy: A review of the literature of 1937, F. M. Rackemann (*Arch. Int. Med., 61 (1938), No. 1, pp. 129–155*).—A review, in continuation of that of the previous year (E. S. R., 78, p. 249), presented with a list of 128 references to the literature.

Domestic animal diseases produced by light, H. F. Blum. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 3, pp. 185–191, fig. 1*).—This contribution is presented with a list of 37 references to the literature cited.

Communicability of infectious abortion between swine and cattle, W. E. Cotton, J. M. Buck, and H. E. Smith (*U. S. Dept. Agr., Tech. Bul. 629 (1938), pp. 8*).—Experiments carried out at Bethesda, Md., with a view to obtaining more definite information as to the susceptibility of cattle to the swine type of *Brucella abortus* are reported. In the course of the work, in which 8 pregnant heifers and cows were given severe artificial exposure to *B. abortus* of the porcine type through the conjunctiva, conjunctiva and digestive system, or the skin, maximum agglutination reactions were produced varying in titer from 1 to 25 (in 1 animal which received skin exposure), to 1 to 2,000 (in an animal given conjunctival exposure). Only 2 of these animals aborted, and they together with another animal that produced a vigorous calf were infected with *B. abortus* (porcine).

In another test 11 pregnant heifers and cows were subjected to contact exposure by being confined in a small pen for several months with swine which had been artificially infected with *B. abortus* (porcine). Several sows aborted during the time of exposure. Two heifers for a short time acquired a maximum titer of 1 to 200 and several others developed lesser reactions; all cattle soon became negative and none aborted. *Brucella* infection was not demonstrated in the uterus or colostrum in any case at the time of calving.

Degenerative arthritis: A comparison of the pathological changes in man and equines, G. R. Callender and R. A. Kelser (*Amer. Jour. Path., 14 (1938), No. 3, pp. 253–272, pls. 5*).—It is pointed out that degenerative arthritis, which is a definite disease entity of unknown etiology that commences as a degeneration of joint cartilage and involves bone only secondarily, exists in many animal species and is an important cause of disability in man and equines. The lesions in man and horses and mules are practically identical in character, though the most advanced lesions are not ordinarily found in equines because the resulting disability causes them to be destroyed before the changes reach such a stage. Symptomatic degenerative arthritis occurs in equines from less advanced lesions than in man. It appears that the greater the physical activity of the individual, man or animal, the more serious does this condition become.

Influenza virus infection of rats and guinea pigs, C. H. Stuart-Harris (*Brit. Jour. Expt. Path., 18 (1937), No. 6, pp. 485–492*).—Reporting further

(E. S. R., 77, p. 247), the author finds that influenza virus which has been passed through ferrets will produce an inapparent infection in the rat and guinea pig. The virus is recoverable from both the nose and lung of the rat after inoculation under an anesthetic, but only from the nose of the guinea pig. In neither animal is the infection transmissible by contact.

The occurrence of Salmonella newport in domestic animals, P. R. Edwards. (Ky. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, *93* (*1938*), *No. 3*, *pp. 192, 193*).—Report is made of the presence of *S. newport* in infections of domestic animals in the United States. This organism was recognized in hogs, cattle, and chickens. In one instance both *S. newport* and *S. senftenberg* were recovered from the same chicken.

A new Salmonella type: Salmonella kentucky, P. R. Edwards. (Ky. Expt. Sta.). (*Jour. Hyg.* [*London*], *38* (*1938*), *No. 3*, *pp. 306–308*).—A new *Salmonella* type isolated in March 1937 from a chicken affected with coccidiosis and ulcerative enteritis is described under the name *S. kentucky* (E. S. R., 79, p. 534). "The organism possesses two hitherto undescribed antigens, one somatic, the other flagellar. It exhibits alpha-beta phase variation, and the alpha phase is identical with the specific phase of *S. typhimurium*. The antigenic formula of *S. kentucky* is VIII XX : i–z6 :–."

Studies in staphylococci and staphylococcal immunity, A. Flaum (*Acta Path. et Microbiol. Scand.*, *Sup. 35* (*1938*), *pp. VI+137*, *figs. 4*).—A report of an investigation conducted from 1935 to 1938, presented with an 11-page list of references to the literature cited.

Studies on hemolytic streptococci.—V, The characteristics of human and animal strains of groups A and C, A. C. Evans and E. Verder (*Jour. Bact.*, *36* (*1938*), *No. 2*, *pp. 133–147*).—In further work (E. S. R., 78, p. 107) the authors have found animal strains of hemolytic streptococci of groups A and C to be more diverse than human strains in their reactions in trehalose and sorbitol broths. "Among the 147 strains of animal origin 32, including the 26 strains of *Streptococcus equi*, fermented neither substance; 33, including 10 strains of group A, behaved like human strains in fermenting trehalose but not sorbitol; and 82 strains, or 55.8 percent of the total number, fermented sorbitol but not trehalose."

Studies on the bionomics and control of the bursate nematodes of horses and sheep.—V, Comparisons of the lethal effects of some non-nitrogenous fertilizers on the free-living stages of sclerostomes, I. W. Parnell (*Canad. Jour. Res.*, *16* (*1938*), *No. 4*, *Sect. D*, *pp. 73–88*, *figs. 6*).—In reporting further (E. S. R., 78, p. 101) the author deals with the effect of some nonnitrogenous artificial fertilizers containing potash, phosphoric acid, or calcium on the free-living stages of sclerostomes. "Of these fertilizers kainite has most practical advantages. Under the conditions of the experiments, which are otherwise ideal for the survival of the larvae, 1 part of kainite to 23 parts of fresh horse feces is necessary to sterilize them. The proportions in which the other fertilizers must be mixed are: Muriate of potash 1:17 (potassium chloride, one of the main constituents of the previous fertilizer, is rather more lethal), carbonate of potash 1:13, [and] sulfate of potash 1:5. Superphosphate (20 percent), sterilized when mixed at 1:5, and 16 percent superphosphate required 2:5. Basic slag and raw rock phosphate (Florida) had no sterilizing value. Lime, in spite of its reputation as a sterilizing agent for many pests has, when mixed with fresh feces, little effect on the free-living stages of sclerostomes."

The treatment of heart-worm infestation, C. E. Bild (*Jour. Amer. Vet. Med. Assoc.*, *93* (*1938*), *No. 3*, *pp. 179–184*).—The author has found the direct smear method of heart worm diagnosis to be satisfactory and accurate. An account is given of treatment by injections of the antimony salts filsol and fuadin, preferably intravenously, as employed in Florida. In this way the mortality rate may be kept down to 3 percent.

Studies in animal trypanosomiases, I–III, M. H. French (*Jour. Compar. Path. and Ther., 51 (1938), No. 1, pp. 23–45*).—Three contributions are presented: I, Nitrogen and Mineral Metabolic Disturbances Induced by *Trypanosoma congolense* and *Trypanosoma brucei* (pp. 23–35); II, Disturbances Produced in the Plasma Proteins by *Trypanosoma congolense* and *Trypanosoma brucei* (pp. 36–41); and III, The Effects of *Trypanosoma congolense* and *Trypanosoma brucei* on Blood Urea (pp. 42–45).

Studies in avian tuberculosis, I–IV, A. B. Crawford. (U. S. D. A.). (*Amer. Rev. Tuberc., 37 (1938), No. 6, pp. 579–597*).—This contribution is presented in four parts.

I. *Avian tubercle bacilli in generalized disease in swine* (pp. 579–581).—Report is made of the typing of lesions in 36 swine condemned for tuberculosis in 5 of the North Central States, 21 of which were found to be affected with the avian type of tubercle bacillus and 15 with the bovine type.

II. *Comparative virulence of avian and bovine tubercle bacilli for rabbits and guinea pigs* (pp. 582–587).—It is reported that "in a series of 42 rabbits inoculated intravenously with suspensions of the avian type of tuberculous tissue from swine and a series of 30 rabbits inoculated with similar suspensions of the bovine type of infection in swine the bovine tubercle bacillus was shown to be decidedly more virulent for the rabbit than the avian type. In the bovine series 100 percent of the rabbits died of tuberculosis within 99 days, whereas in the avian series only 23 percent died within this period. In the bovine series the lungs were the chief site of localization, while in the avian series the lungs were only relatively slightly affected and the chief site of localization was variable."

III. *Sensitization method of differentiating avian from bovine infection in guinea pigs and rabbits* (pp. 588–593).—Work with the sensitization method of differentiating avian from bovine infection in swine tuberculosis has shown it to be specific. Of 36 specimens, 21 caused in guinea pigs a sensitization specific to avian tuberculin and 15 to mammalian tuberculin. These figures were in complete agreement with the animal inoculation test and culture typing. The results of an experiment are shown which indicate that dual infection with avian and bovine tubercle bacilli may be detected by the sensitization method.

IV. *The possible rôle of the avian tubercle bacillus in infection in man* (pp. 594–597).—The author has found the few proved cases of avian type of tuberculous infection in man to indicate that the human species is very resistant to this type of infection or that the amount of exposure is insufficient to cause the disease except in rare instances.

A list of 10 references to the literature considered in these contributions is included.

An experimental investigation of lechuguilla poisoning, F. P. Mathews (*Arch. Path., 25 (1938), No. 5, pp. 661–683, figs. 3*).—This contribution reports the results of experimental investigations of both the photodynamic and the toxicologic aspects of lechuguilla poisoning as it may be produced in rats, rabbits, and guinea pigs. The work was conducted in connection with that relating to its natural occurrence and experimental studies with sheep and goats (E. S. R., 78, p. 394).

Lechuguilla (Agave lecheguilla) poisoning in sheep and goats, F. P. Mathews. (Tex. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 3, pp. 168–175, figs. 5*).—The results of further experiments conducted at the Loco Weed Research Laboratory to determine the toxic action of lechuguilla when fed alone and with alfalfa hay to animals exposed to direct sunlight or diffused light are reported upon. The disease was reproduced by feeding the leaves of the plant to sheep and goats under experimental conditions. Both aqueous and alcoholic extracts of the plant were found to be toxic. An uncomplicated photosensitization was produced in sheep by feeding the hydrolyzed products of the alcoholic extract.

The Sudan grass poisoning problem, F. B. Hadley. (Univ. Wis.). (*Canad. Jour. Compar. Med., 2 (1938), No. 6, pp. 169, 170*).—Investigations of Sudan grass poisoning of cattle in Wisconsin in 1937 are summarized.

Relation of bitterness to the toxic principle in sweetclover, W. K. Smith and R. A. Brink. (U. S. D. A. and Wis. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *57 (1938), No. 2, pp. 145–154*).—Studies on the relation between the two undesirable characteristics, bitterness and toxicity, of sweetclover are reported. The authors have found that "*Melilotus alba,* a bitter sweetclover, on being stacked at about 50 percent moisture and allowed to heat, gives a hay which, when fed to rabbits, induces a condition characteristic of the so-called sweetclover disease in cattle by markedly lowering the clotting power of the blood. Parallel tests with *M. dentata,* a sweetclover which has recently been recognized as being nonbitter, show that this species does not become toxic on being similarly spoiled. Neither spoiled alfalfa hay nor coumarin appears to modify the clotting power of the blood. If, however, coumarin is mixed with partially cured alfalfa hay containing about 50 percent moisture, the mixture on being allowed to heat becomes distinctly toxic. Melilotic acid and coumaric acid, compounds closely related to coumarin, are like the latter substance in that they do not induce sweetclover disease on being fed to rabbits. In one test melilotic acid lactone added to alfalfa before spoilage, contrary to the behavior of coumarin, did not induce toxicity. It is tentatively suggested that coumarin interacting with another constituent or constituents of the plant tissue, under conditions favorable for spoilage, gives rise to a specific toxic substance which is responsible for the sweetclover disease in animals. Since coumarin appears to be a basic factor in both bitterness and toxicity, the development of nonbitter forms of sweetclover gives promise not only of improving the palatability of this plant but also of eliminating the hazard associated with the feeding of improperly cured hay."

Chronic toxic effects of fluorine ingestion on livestock, G. H. Hart (*Calif. Cattleman, 1 (1936), No. 12, pp. 14, 22*).—Attention is called to the toxic effect on livestock of fluorine, which occurs in drinking water in Modoc County, Calif.

Para-aminosulfamidobenzene in amniotic fluid and placental blood, H. Bauer and M. F. Gunderson. (Univ. Nebr.). (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 2, p. 118*).—Brief reference is made to the determination of the concentration of sulfanilamide in placental blood and amniotic fluid in a cow treated with this drug. One oz. of sulfanilamide was fed daily for 22 consecutive days, the feeding of the drug being ended 12 days before the calf was born. During the period of treatment determinations of the amounts of sulfanilamide excreted in the milk were made every other day. The highest concentration was obtained on the twenty-first day of drug therapy and was 0.7 mg percent. Seven days after the last drug feeding and 5 days before the birth of the calf sulfanilamide was not detectable in the milk or blood of the cow. After parturition samples of placental blood and amniotic fluid were taken, as well as colostrum and blood from the cow. Sulfanilamide was not detectable in the colostrum or blood of the cow but was present in a concentration of 0.5 mg percent in the amniotic fluid, and this same value was obtained for placental blood.

Studies on milk samples from Bang-positive and Bang-negative cows, H. B. MORRISON, JR., and F. E. HULL. (Ky. Expt. Sta.). (*Jour. Milk Technol.*, *1* (*1938*), *No. 5, pp. 3–8*).—In the work reported "a high percentage of Bang's disease reactors gave milk with an agglutinin titer for *Brucella abortus* of 1:50 or higher; many of these cows may discharge *B. abortus* in their milk. The higher percentage of Bang's disease positive cows giving positive reactions to other tests for mastitis indicates that resistance of these cows to other udder infections may be lowered because of the Bang's disease. The management of a herd containing both Bang's disease positive and negative cows is an important factor in the control of mastitis. The best method of management is the immediate elimination of all Bang's disease reactors from the herd. If this is not feasible, the reactors should be isolated from the nonreactors as completely as possible. Under no circumstances should the reactors and nonreactors be allowed to use the same pasture or occupy adjoining stalls in the barn. If reactors and nonreactors are housed in the same barn, the reactors should be milked first. Each of these diseases in itself causes severe economic loss to the dairyman; when both occur together it may mean the difference between success or failure of the dairy enterprise because of the large loss these diseases cause the dairyman."

Bovine mastitis: Infection due to organisms of the coli-aerogenes group, R. GWATKIN, H. M. LEGARD, and S. HADWEN (*Canad. Jour. Compar. Med.*, *2* (*1938*), *No. 6, pp. 155–162*).—In additional work (E. S. R., 79, p. 248), the authors report having encountered 10 cases of bovine mastitis that were apparently due to members of the coli-aerogenes group among 286 cases of mastitis examined. Of these 6 died and 4 recovered. "Two cases were due to an organism of the genus *Aerobacter*. One of these died and the other recovered sufficiently to be disposed of. Three cases were due to members of the genus *Escherichia*. One died, 1 made a complete recovery, and the other recovered with loss of the affected quarter. One case caused by a slow lactose-fermenting organism died. The other 4 cases were due to unidentified members of the coli-aerogenes group, and of these 3 died. *E. communior* was isolated on two occasions from 1 case of chronic mastitis of undetermined etiology, but it was not considered to be the causal agent. Organisms of the coli-aerogenes group were only recovered in 10 cases from clean cows or those with mastitis of determined etiology, so they are neither frequently present in the udder nor common contaminants in properly collected samples. Samples of colostrum usually gave a heavier bacterial growth than normal milk. A member of the coli-aerogenes group was isolated from one quarter each of 2 out of 17 recently freshened cows (30 min. to 3 days after calving). In view of this, the presence of such bacteria in colostrum is not significant unless definite symptoms of mastitis are present."

The authors' experience suggests that the symptoms arising from this type of infection in recently freshened cows may be mistaken for milk fever, and that the udder should be examined for the presence of acute mastitis in such cases. The infection appears to have commenced in hindquarters in 6 cases and in front quarters in 2 cases, while in the other 2 all quarters were involved at the time of examination.

Anatomical and experimental study of the teat of the cow, with particular reference to streptococcal mastitis, T. JOHNSTON (*Jour. Compar. Path. and Ther.*, *51* (*1938*), *No. 1, pp. 69–77, figs. 10*).—Some anatomical features of the teat are noted and discussed by the author. An attempt was made to determine experimentally the probable behavior of streptococci leading up to an attack of mastitis. The findings suggest that mastitis depends on a combination of factors, some of which are associated with the anatomy of the teat and certain conditions to which the udder and teats are subjected.

Excretion of Streptococcus pyogenes in the milk of naturally infected cows, H. C. Bendixen and F. C. Minett (*Jour. Hyg.* [*London*], *38* (*1938*), *No. 3*, *pp. 374–383*, *pl. 1*).—Account is given of two cows which were concerned in milk-borne *Streptococcus* outbreaks at Mørkøv (Denmark) and Doncaster (England), respectively, and which were afterward kept under close observation. The Danish cow excreted *S. pyogenes* from the affected quarter for at least 13 mo., including a dry period of about 3 mo. The other animal excreted similar streptococci for about 6 weeks. In both cases there were stages when symptoms of mastitis were either not evident or not pronounced, although the milk was known to be infective.

Milk epidemic of angina, originating from a cow with mastitis and due to Streptococcus pyogenes (Lancefield group A), E. J. Henningsen and J. Ernst (*Jour. Hyg.* [*London*], *38* (*1938*), *No. 3*, *pp. 384–391*, *fig. 1*).—The authors report on a milk epidemic of septic sore throat in Denmark, comprising about 100 cases. "The epidemic originated from a cow with a slight degree of mastitis, produced by a *S. pyogenes* (Lancefield's group A). The same *Streptococcus* (which we did not succeed in typing) was isolated from 74 percent of the patients examined and from 3 persons who were handling the milk. It seems reasonable to assume that the cow was infected from the milkers. Owing to particular conditions in the distribution of the raw milk, it is possible that the milk delivered raw in the village involved on 1 day a massive contamination. The epidemic is characterized as moderately severe. No case terminated fatally."

The relation between bacterial numbers and biochemical values in milk from streptococcus-free quarters, C. K. Johns and E. G. Hastings (*Canad. Jour. Res.*, *16* (*1938*), *No. 2*, *Sect. D*, *pp. 15–30*, *figs. 8*).—Report is made in this joint contribution from the Canada Department of Agriculture and the University of Wisconsin of an attempt to determine whether abnormalities in the composition of the milk from streptococcus-free quarters of the udder of dairy cows are due to bacterial infection. It is concluded that no one type of organism is associated with changes in the composition of the secretion.

Mastitis control program proved successful: Program carried on in Upper Peninsula Sub-Station dairy herd, R. E. Horwood and C. S. Bryan (*Michigan Sta. Quart. Bul.*, *21* (*1938*), *No. 1*, *pp. 34*, *35*).—A brief account of a control program started in the Chatham Substation dairy herd in 1934.

Three cases of nodular necrosis (Roeckl's granuloma) in the muscles of cattle, N. H. Hole (*Jour. Compar. Path. and Ther.*, *51* (*1938*), *No. 1*, *pp. 9–22*, *figs. 10*).—Report is made of three cases of nodular necrosis observed in the muscles of cattle. The absorption of such lesions during life is recorded, and the morbid anatomy and histology is described and discussed. No further light is thrown on the etiology.

Influence of the dose of virus employed in testing the immunity of cattle vaccinated against cattle plague, S. C. J. Bennett and J. T. R. Evans (*Jour. Compar. Path. and Ther.*, *51* (*1938*), *No. 1*, *pp. 1–8*).—The authors confirm earlier work (E. S. R., 75, p. 695), showing that immunity following vaccination with a single dose of rinderpest vaccine persists in most cattle for about a year. The immunity, if artificially tested, is no more likely to be broken down by a large dose of virus than by a small dose. Thus, it appears that cattle destined for use as rinderpest serum producers may be hyperimmunized several months after vaccination without fear of incurring more than minimal casualties.

[Contributions on a flagellate of cattle] (*Amer Jour. Hyg., 28 (1938), No. 1, pp. 40–50, 80–84, 138–147*).—Three contributions reporting observations of *Trichomonas foetus* in cattle are presented, namely, *Trichomonas foetus* in Bulls, by J. Andrews and F. W. Miller (pp. 40–50); Glycogen Content of a Flagellate of Cattle, *Trichomonas foetus*, by H. M. Stewart (pp. 80–84); and Quantitative Studies on Glucose Consumption by *Trichomonas foetus*, by J. Andrews and T. von Brand (pp. 138–147).

Contribution to a study of pyobacillosis of calves [trans. title], A. M. Penha (*Arch. Inst. Biol. [São Paulo], 8 (1937), pp. 189–196, pls. 2; Eng. abs., p. 195*).—This is a report of a study of a common disease of calves in Brazil, the cultural properties of the causative organism of which are the same as those of strains of *Corynebacterium pyogenes* isolated from cases of pneumonia in calves, swine pyobacillosis, and mastitis of cows. A list is given of 20 references to the literature.

Studies on coast disease of sheep in South Australia, H. R. Marston et al. (*Austral. Council Sci. and Indus. Res. Bul. 113 (1938), pp. 91, pls. 4, figs. 15*).—Following a brief introduction by H. R. Marston (pp. 9–13), the symptomatology and etiology of coast disease and its relationship with some other maladies affecting grazing ruminants is considered by H. R. Marston (pp. 14–22); ataxia in lambs, by L. B. Bull, H. R. Marston, D. Murnane, and E. W. L. Lines (pp. 23–27); the influence of geological conditions and soil composition on the regional distribution of coast disease in sheep in South Australia, by R. G. Thomas (pp. 28–39); distribution of coast disease in South Australia, by D. Murnane (pp. 40–47); investigations on Kangaroo Island, by E. W. L. Lines (pp. 48–71); the effects which follow treatment of coast disease in mature ewes with cobalt, copper, and other elements, by H. R. Marston and I. W. McDonald (pp. 72–78): the effects of administering cobalt, copper, and other elements to young sheep depastured on "coasty" country, by H. R. Marston and I. W. McDonald (pp. 79–85); and iron and copper in certain organs from sheep with coast disease, by H. O. Moore (pp. 86–91).

Epizootic adenomatosis in the lungs of sheep—comparisons with jaagsiekte, verminous pneumonia, and progressive pneumonia, N. Dungal, G. Gíslason, and E. L. Taylor (*Jour. Compar. Path. and Ther., 51 (1938), No. 1, pp. 46–68, figs. 8*).—An account is given of adenomatosis of sheep, apparently infectious in nature, which has recently been introduced into Iceland and in the course of about 1.5 yr. has caused the loss of approximately 50 percent of an affected flock. This disease runs a very chronic course and has an incubation period of from 6 to 8 mo., or even more. The chief clinical symptoms are respiratory distress, bronchial râles, nasal flow of mucus, and frothy, watery exudate in the bronchi, but no fever.

"Transmission has been easily effected by housing sheep together, but intrapulmonary inoculation was only successful in transmitting the disease once out of three attempts made. Up to the present the disease has not been transmitted by the injection of bacteria-free filtrates, but no micro-organism has been found which can reasonably be regarded as the causative agent. The possibility of its cause being due to the presence of parasitic lungworms appears to have been eliminated."

Pneumonia in Rocky Mountain bighorn sheep, H. Marsh. (Mont. Expt. Sta. et al.). (*Jour. Mammal., 19 (1938), No. 2, pp. 214–219*).—The author reports upon investigations conducted to determine the cause of disease losses in the Rocky Mountain bighorn sheep. These losses were found to have been caused by respiratory diseases of two types, a somewhat chronic pneumonia having caused death principally in mature sheep while an acute pneumonia killed lambs at the age of from 2 to 3 mo. The lungworm *Protostrongylus stilesi* was found to be the primary etiological factor in the principal group of cases of pneumonia, with secondary bacterial invasion. The diphtheroid *Corynebacterium pyogenes* was the principal organism involved, although a *Pasteurella* was found constantly present in the affected lungs.

The losses from pneumonia in young lambs on the National Bison Range are of a different type from those observed in older sheep. Parasites are not involved in these cases, and the pneumonia is of an acute type. The findings in the only two cases in which bacteriological and histological work was done indicate that the pneumonia is primarily due to invasion by a *Pasteurella*, with *C. pyogenes* as a secondary invader.

Dysentery of new-born lambs, H. Marsh and E. A. Tunnicliff (*Montana Sta. Bul. 361 (1938), pp. 42*).—This is a summary of an investigation conducted by the authors, reports relating to which by Marsh, Tunnicliff, and Jungherr (E. S. R., 68, p. 673) and by Tunnicliff (E. S. R., 69, p. 859) have been noted. The affection in newborn lambs, as it occurs in the northwestern United States, is the resultant of several factors rather than a specific infectious disease caused by a specific pathogenic micro-organism. Those factors are low temperatures, resulting in lowered vitality, or resistance, of the lambs; unsanitary conditions of lambing sheds and corrals, resulting in the ingestion during the first day of the life of the lamb of a relatively large number of bacteria in filth; and the presence in the environment of strains of intestinal bacteria which are potentially pathogenic. The work has shown the bacteria directly involved to be the species commonly found in the intestinal tracts of normal lambs, usually *Escherichia communior* or closely related species, and, more rarely, *Clostridium welchii*.

"Attempts to control the disease by the use of antiserums prepared by the use of *Escherichia* cultures recovered from lambs dead of dysentery have produced unsatisfactory results, although they have not been entirely without effect. Treatment of affected lambs with intestinal antiseptics has been of some value when the treatment was started early. The losses have also been definitely reduced by the administration of an intestinal antiseptic to all lambs born during a severe outbreak. Fundamentally, the problem of the prevention of dysentery of newborn lambs is a sanitation problem."

A list of 23 references to the literature is included.

The toxicity of intestinal filtrates from lambs dead of overeating, I. E. Newsom and F. Thorp, Jr. (Colo. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 3, pp. 165–167*).—In the course of the investigation here reported, "45 percent of intestinal filtrates from 256 lambs dead of overeating were shown to be toxic for laboratory animals. Of 87 similar filtrates from lambs dead of other diseases only 2 were toxic, 1 from a lamb dead of coccidiosis and 1 from a case of ruptured bladder. Twelve out of 20 of the filtrates proved fatal to sheep when injected in amounts varying from 5 to 50 cc. Heating the filtrates to 60° C. for 30 min. rendered them harmless. The toxin was neutralized by antiserums made from the lamb dysentery bacillus and from *B[acillus] ovitoxicus* but not by those made from *Cl[ostridium] welchii* or *B. paludis*. While overeating seems to differ from enterotoxemia on the basis of symptoms and lesions, the intestinal contents of lambs dead of the two diseases contain toxic substances that seem to be identical."

The occurrence of swine erysipelas in New South Wales, L. Hart (*Austral. Vet. Jour., 14 (1938), No. 1, pp. 12–15, fig. 1*).—A description is given of two cases of a disease in pigs from which the swine erysipelas organism (*Erysipelothrix rhusiopathiae*) was isolated. It is said to be the first record of the occurrence of the disease in New South Wales.

Investigations on trichinosis in Canada.—I, A preliminary survey of the incidence of Trichinella spiralis in hogs in eastern Canada, T. W. M. Cameron (*Canad. Jour. Res., 16 (1938), No. 4, Sect. D, pp. 89–92*).—Report is made of a preliminary survey conducted during 1937 in which 729 hogs from eastern Canada were examined by both digestion and compression technics. Fifteen, or 2.06 percent, were found to be infected with living encysted larvae of *T. spiralis*.

Brucellosis in horses, W. S. Stone (*Cornell Vet., 28 (1938), No. 2, pp. 91–98*).—Following a review of the literature, with a list of 19 references, the results of a comparison made of *Brucella* agglutinins in New York City, the country, and clinical horses in New York State, and a summary of the agglutination titers of healthy horses and random samples found in other countries, are presented in 2 tables. In agglutination tests made of 1,172 samples of blood from horses in New York City, 205 samples from country horses, and 135 samples from clinical horses, 64.6, 53.6, and 43.7 percent, respectively, were negative, while 9.6, 23.9, and 45.2 percent, respectively, reacted at dilutions of 1:50 or higher. It is concluded that agglutinins are found in apparently normal horses as well as those affected with fistulous withers and poll evil. "The titer found does not seem to be an indication of either active or latent infection. Horses in contact with cattle have a higher incidence of brucellosis than those kept away from cattle or maintained in cities. Horses may be a factor in transmitting Bang's disease to cattle. There is evidence that undulant fever may be contracted from the discharge of *Brucella*-infected horses."

Studies in equine encephalomyelitis: Chick embryo vaccine as a protective agent, C. A. Mitchell, R. V. L. Walker, and P. J. G. Plummer (*Canad. Jour. Compar. Med., 2 (1938), No. 8, pp. 211–222*).—In the course of their investigation of equine encephalomyelitis the authors have found that the virus when grown in chick embryo reaches a much higher titer than in any other infective tissue examined. "A solid immunity was induced in guinea pigs inoculated with formolized chick embryo vaccine. Formolized horse brain vaccine failed to induce an appreciable protection in guinea pigs. Four horses inoculated with chick embryo vaccine showed no evidence of illness when challenged by an intracranial inoculation of virus contained in guinea pig brain. Four of five control animals challenged in a similar manner became infected."

Infectious encephalomyelitis of the horse in Brazil [trans. title], V. Carneiro (*Arch. Inst. Biol. [São Paulo], 8 (1937), pp. 115–134, pls. 8; Eng. abs., pp. 132, 133*).—An outbreak of disease among horses in the municipality of Tatuhy, São Paulo, in which 60 animals were affected, was found to resemble infectious encephalomyelitis as met with in the United States. The virus of this disease was isolated for the first time in Brazil. A list of 30 references to the literature is included.

[Work with poultry diseases by the North Carolina Station] (*North Carolina Sta. Rpts. 1936, pp. 54–56; 1937, pp. 72–75, 76, 77*).—The work of the year 1936 relates to investigations of septicemic diseases, by R. S. Dearstyne, R. E. Greaves, and J. W. Kelly; and of the year 1937 to investigations of septicemic diseases among fowls in North Carolina—studies on normal agglutinins, and a search for a "virulence" antigen in *Salmonella pullorum, S. gallinarum*, and *S. aertrycke*, both by Dearstyne, Greaves, and H. C. Gauger (E. S. R., 79, p. 111); and paratyphoid infection in pigeons, by Gauger and Dearstyne.

Infectious entero-hepatitis (blackhead) of chickens, L. Hart (*Agr. Gaz. N. S. Wales, 48 (1937), No. 12, pp. 705, 706, figs. 2*).—This disease, which has been the cause of mortality in turkeys in New South Wales for many years, has been recognized in chickens in the State for the first time.

Treatment of fowl coryza of chickens with argyrol, E. M. Dickinson and J. R. Beach. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 2, p. 108*).—The injection of a fresh solution of 15 percent argyrol into the infraorbital sinus of White Leghorn chickens suffering from fowl coryza by a method successfully employed by Dickinson and Hinshaw noted on page 111 for infectious sinusitis in turkeys failed to give any evidence of a curative value of this drug. These results are said to be contrary to the report of Gutierrez (E. S. R., 77, p. 703) that the injection of a 1-percent solution of argyrol into the nasal passages of chickens with roup brought about complete recovery in from 3 to 5 days.

The reactivation of the fowl-leukosis agent after inactivation by oxydization, J. Engelbreth-Holm and O. Frederiksen (*Acta Path. et Microbiol. Scand., Sup. 37 (1938), pp. 138–144*).—It is shown in this contribution that "the agent of fowl leukosis, like the agent of fowl sarcoma, can be totally inactivated by means of oxidation. If oxidation is interrupted at a time when inactivation' is incomplete but where the potency of the agent is considerably reduced, it is possible by means of a reduction process to reactivate the agent to almost the same potency as prior to oxidation. These facts seem little compatible at first sight with the view that this virus is a living microorganism, whereas they agree very well with the assumption that the leukosis virus is an inanimate, relatively simply compounded chemical substance."

Plasmodium lophurae, a new species of malaria parasite pathogenic for the domestic fowl, L. T. Coggeshall (*Amer. Jour. Hyg., 27 (1938), No. 3, pp. 615–618, pl. 1*).—Under the name *P. lophurae* the author describes a new species of avian plasmodium pathogenic for the domestic fowl. This was isolated from a Borneo fireback pheasant (*Lophura igniti igniti*).

Pseudo fowl pest (*Ceylon Dept. Agr. Leaflet 101 (1937), pp. 2*).—A brief practical account of pseudo fowl pest, also known as Newcastle disease, avian pest, and Ranikhet disease.

Fowl tick fever (spirochaetosis), also transmitted by common red mite, T. G. Hungerford and L. Hart (*Agr. Gaz. N. S. Wales, 48 (1937), No. 10, pp. 591, 592, fig. 1*).—Since the evidence incriminating the red mite of poultry *Dermanyssus avium* as a vector of spirochetosis of the fowl has not been conclusive heretofore, some of the details regarding an outbreak in which it did act as a vector are presented. It is pointed out that spirochetosis is a well-known disease in the inland districts of New South Wales and occurs on farms in the coastal areas to a lesser extent.

An unusual outbreak of chicken-pox, E. P. Johnson. (Va. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 2, pp. 115, 116, fig. 1*).—Report is made of an outbreak of fowl pox that occurred in a flock of 1,200 6-week-old White Plymouth Rock broilers, in which about 60 birds developed sores or scabs on the feet and legs. It is concluded that the absence of lesions on the combs and wattles was due to the lack of development of combs and wattles at this early age in this breed. No explanation is given for the absence of throat lesions in the outbreak other than that there is some difference in strains of chicken pox virus in their affinity for certain tissues.

Cultivation of pigeon-pox virus on the chorioallantoic membrane, F. R. Beaudette and C. B. Hudson. (N. J. Expt. Stas.). (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 3, pp. 146–150*).—Following a brief introduction the authors report on the isolation of pigeon pox virus, serial and collateral passages, neutralization tests, cultivation in alien eggs, titrations, and field tests. Data on serial passage of pigeon pox virus are given in table form.

A tripathogenic pox virus of the canary [trans. title], J. REIS and P. NOBREGA (*Arch. Inst. Biol.* [*São Paulo*], *8* (*1937*), *pp. 211–214, pls. 2; Eng. abs., p. 213*).—A description is given of a strain of avian pox virus which presents the peculiarity of being tripathogenic, as shown by its ability to infect chicks, pigeons, and passerine birds. It is pointed out that the virus is not a mixed one, since it does not dissociate into monopathogenic strains even after 15 serial passages through chicks, pigeons, and canaries. It was isolated from canaries (*Serinus canarius* and *Sicalis flaveola*) suffering from severe pox disease, which caused 98 percent mortality among them. Birds vaccinated with this pox virus showed a high degree of resistance against reinfection with the same virus and with those of fowl and pigeon pox. Chicks and pigeons can be successfully immunized against the canary pox virus by a previous infection with the viruses of fowl and pigeon pox, respectively.

Studies on the trematode parasites of ducks in Michigan, with special reference to the mallard, W. C. GOWER (*Michigan Sta. Mem. 3* (*1938*), *pp. 94, figs. 7*).—Following a brief introduction, part 1 (pp. 9–29) of this contribution presents accounts of the flukes found to parasitize ducks in Michigan, 15 in number, of which 3 are described as new, and a genus is erected. Part 2 (pp. 31–75) gives a key to the genera of these flukes, diagnosis of families, genera, and species, and a host list of the flukes reported from ducks. A list of 189 references to the literature is included.

Sinusitis of turkeys and its treatment, D. E. MADSEN (*Utah Sta. Bul. 280* (*1938*), *pp. 12, fig. 1*).—Work with sinusitis, which causes considerable losses yearly in the turkey industry in Utah, is reported. The symptoms of this affection consist of a watery discharge from the nostrils and eyes, followed by a swelling of the face as a result of inflammation and accumulation of mucus in the sinuses. The loss is occasioned through a pronounced reduction in weight gains of turkeys rather than a high mortality. Limited trials have shown that it can be transmitted by inoculation with sinus exudates. The use of vaccines failed to control the disease. The administration of silver-nitrate solution was found far superior to other medicaments as a treatment, a 4-percent solution having given slightly better results than a 2-percent. The syringe method of draining and treating the sinus was found superior to the use of the knife.

Treatment of infectious sinusitis of turkeys with argyrol and silver nitrate, E. M. DICKINSON and W. R. HINSHAW. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc., 93* (*1938*), *No. 3, pp. 151–156, fig. 1*).—The treatment of infectious sinusitis (swellhead) of turkeys, which causes severe financial losses to growers each year, is reported upon. The authors have found that it can be successfully treated by injecting either 4 percent silver nitrate or 15 percent argyrol into the sinuses after the sinus exudate has been aspirated. Silver nitrate was slightly more efficient than argyrol.

Transmission of Pasteurella cuniculicida in rabbits by breeding, F. D. MCKENNEDY and J. E. SHILLINGER. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 93* (*1938*), *No. 3, pp. 161–164*).—Three experiments are reported which show that hemorrhagic septicemia of domestic rabbits infrequently becomes localized in the testicle of the male in the form of an abscess. "Recognition of such infected animals is important, because females can regularly be infected from such a source. The results obtained indicate that the strain of *P. cuniculicida* isolated is not readily transmitted by the healthy male from infected to noninfected females, although the wide variation in pathogenicity of different strains of *P. cuniculicida* as well as differences in individual susceptibility of test animals would probably affect the results obtained from the use of a different strain of the organism or from using a larger series of animals."

Shock disease of wild snowshoe rabbits, R. G. Green and C. L. Larson (*Amer. Jour. Physiol., 119 (1937), No. 2, pp. 319, 320*).—An abstract of a contribution presented at the annual meeting of American Physiological Society at Memphis, Tenn., in April 1937.

Shock disease and the snowshoe hare cycle, R. G. Green and C. L. Larson (*Science, 87 (1938), No. 2257, pp. 298, 299*).—It has been found in the course of extensive studies of hare population and from supporting investigations on hare samplings throughout Minnesota that the die-off of snowshoe hares which occurs approximately every 10 yr. is due to a new disease entity in the hare, to which the name shock disease is applied. Hares suffering from shock disease appear perfectly normal until they are suddenly stricken with convulsions and die in the seizures or abruptly sink into a fatal coma. The term shock disease was first used after it was recognized that some hares trapped and held in captivity died from the shock of change in environment. It was later learned that the convulsive seizures in these animals were hypoglycemic in character and that death was usually due to an abnormally low blood sugar. So far as the authors have been able to determine, the basis of the disease is a degeneration of the liver. "Usually in advanced cases the liver is a dark mahogany in color and is atrophic and definitely smaller than normal, so that the capsule is separated from the parenchyma and lies as a wrinkled membrane over the surface of the organ. Microscopically, the liver cords are highly atrophic. Thus far we have recognized consistent changes in the liver; pathological findings in other organs are variable."

AGRICULTURAL ENGINEERING

Surface water supply of the United States, 1936, Parts 2, 5 (*U. S. Geol. Survey, Water-Supply Papers 802 (1938), pp. VI+228, pl. 1; 805 (1938), pp. VI+288, pl. 1*).—These papers present the results of measurements of flow made on streams during the year ended September 30, 1936, No. 802 covering the South Atlantic slope and eastern Gulf of Mexico basins, and No. 805 the Hudson Bay and upper Mississippi River basins.

Surface water supply of Hawaii, July 1, 1935, to June 30, 1936 (*U. S. Geol. Survey, Water-Supply Paper 815 (1938), pp. IV+108*).—This report presents the results of measurements of the flow of streams and ditches.

Public Roads, [August 1938] (*U. S. Dept. Agr. Public Roads, 19 (1938), No. 6, pp. [2]+101-123+[1], figs. 10*).—This number contains data on the various highway projects as of July 31, 1938, and the following articles: Study and Standard of Quality of a Road Surface, by R. H. Baldock (pp. 101-111, 121); and Study of Road Subsoils, by C. A. Hogentogler (pp. 112-120).

Farm building surveys in Wisconsin, Kansas, Georgia, and Illinois, J. R. Dodge (Coop. Univs. Wis., Ga., and Ill. and Kans. State Col.). (*U. S. Dept. Agr., Misc. Pub. 311 (1938), pp. 16*).—These surveys covered selected townships in these States, with the purpose to show the actual condition of farm buildings and to determine the best approach to the problem of improving the standards of farm structures.

It was found that in these areas many structures must be repaired at once or they will soon be worthless, and many have already deteriorated beyond repair. On the majority of farms, buildings have not been properly maintained since the post-war drop in farm prices in 1920. Despite an increase in farm income, the expenditures for improvements made in these localities during 1936 were not sufficient even to cover current depreciation.

The type and size of structures needed on farms has changed considerably in many sections of the country. For example, in the Kansas township surveyed, farms have increased in size since wheat has proved more dependable there than corn, alfalfa, and livestock. The type of crops grown has changed in other cases, and yields per acre of many crops have increased since the buildings were constructed. As a result there is a great need for replacement or remodeling of many of the older buildings.

The Forest Products Laboratory (*U. S. Dept. Agr., Misc. Pub. 306 (1938), pp.* [2]+*33, figs. 44*).—A brief account is given of the work and objectives of the Forest Products Laboratory of the Forest Service at Madison, Wis.

Surface run-off and erosion on granitic mountain soils of Idaho as influenced by range cover, soil disturbance, slope, and precipitation intensity, G. W. Craddock and C. K. Pearse (*U. S. Dept. Agr. Circ. 482 (1938), pp. 24, figs. 8*).—This report presents an analysis of data collected during studies of four important herbaceous range cover types with reference to their relative effectiveness in controlling run-off and erosion under conditions of soil disturbance, slope, and rainfall intensity. In these studies a specially designed rainmaking apparatus was employed.

The superiority of the wheatgrass range cover for controlling run-off and erosion was considered to be the most striking result of the study. This type of range yielded practically no run-off or eroded material as compared to an average run-off of 45.4 percent and amount of eroded material of 3.69 tons per acre on the other three types of ranges studied. Moreover, the wheatgrass cover was equally effective under all conditions, on 40-percent as well as 30-percent slopes when subjected to either high or moderately heavy rainfall intensities and when the soil was thoroughly disturbed to simulate trampling by grazing animals or left undisturbed.

Although much less effective than wheatgrass, downy chess range which yielded on the average only 25.5 percent run-off and 1.05 tons of eroded soil per acre was about twice as effective for controlling run-off as lupine-needlegrass and annual weed cover types, and from two to seven times more efficient in preventing erosion.

In the lupine-needlegrass type, high-intensity rainfall is destructive, and even storms of moderate intensity cause dangerously large amounts of run-off and erosion. This range type is considered to be highly ineffective and undesirable for watershed protection.

Moisture movement in wood above the fiber-saturation point, L. W. Rees and S. J. Buckman. (Minn. Expt. Sta. et al.). (*Jour. Agr. Res.* [*U. S.*], *57 (1938), No. 3, pp. 161–187, figs. 6*).—Studies are reported on the relative rates of moisture movement in the different structural directions of heartwood and sapwood of different woods containing a maximum amount of free water at the beginning of the drying process. Work was done with six different hardwoods and one softwood.

All of the curves for the rate of moisture loss plotted against the percentage of the total removable water when movement was confined to the longitudinal direction were found to be divisible into two periods, (1) a constant rate period and (2) a falling rate period. When the moisture movement was confined to the radial and tangential directions constant rate periods were observed for only silver maple sapwood, basswood heartwood, and in the case of radial movement, for red (Norway) pine sapwood.

The existence of the constant and falling rate periods was considered from the standpoint of the drying of wood. The rates of moisture loss during the constant rate period were of the same order of magnitude regardless of the kind of wood or the direction of flow, and information was presented supporting the view that the rate of moisture loss during the constant rate period was somewhat less than the rate of evaporation from a free water surface.

A linear relationship was found to exist between the critical moisture content (the percentage of the removable water remaining in the wood at the termination of the constant rate period) and the specific gravity of the different woods when the moisture movement was confined to the longitudinal direction.

The rates of moisture movement in the longitudinal direction varied from 1.2 to 25.5 times those in the radial and tangential directions when 50 percent of the total removable water remained in the wood. Although the differences between the rates of movement in the different structural directions were generally slightly less when 25 percent of the total removable water remained in the wood, the values were of a comparable order of magnitude.

The average rates of moisture movement in the longitudinal direction were 5.9 to 4.8 times those for moisture movement in the radial direction when 50 and 25 percent of the total removable water remained in the wood, and were 9.7 and 7.8 times those for moisture movement in the tangential direction when the same amounts of total removable water remained in the wood. The rates of moisture movement in the radial direction varied from 0.2 to 4.9 times those in the tangential direction, with respective average rates when 50 and 25 percent of the total removable water remained in the wood, of 1.9 and 2 times those in the tangential direction.

An exponential relationship was found to exist between the rate of moisture movement in the longitudinal direction and the specific gravity of the different woods when 50 percent of the total removable water remained in the wood. Evidence was presented that the same general type of relationship exists between the rate of moisture movement in the longitudinal direction and specific gravity when 25 percent of the total removable water remained in the wood. Likewise, the same general type of relationship seems to apply for moisture movement in the radial and tangential directions when 50 and 25 percent of the total removable water remained in the wood, although there were appreciable deviations from the general rate of moisture movement-specific gravity relationship for moisture movement in the radial and tangential directions.

Modernizing cotton gins, C. A. BENNETT, T. L. BAGGETTE, and F. L. GERDES (*U S. Dept. Agr., Farmers' Bul. 1802 (1938), pp. II+52, figs. 41*).—Practical information is presented on methods and cost of modernizing gin machinery.

Studies of potato storage houses in Maine, A. D. EDGAR. (Coop. Maine Expt. Sta. et al.). (*U. S. Dept. Agr., Tech. Bul. 615 (1938), pp. 47, figs. 29*).—Studies are reported the purpose of which was to determine the most satisfactory storage conditions for potatoes in the colder regions of the United States and to develop durable structures in which desirable storage conditions can be maintained with a minimum of attention. An effort also was made to develop a system of handling potatoes in the houses to decrease labor requirements and reduce injury to the potatoes.

It was found that potatoes stored at 40° F. and at a uniform relative humidity have a uniform rate of shrinkage between the thirtieth and the two hundred and tenth day, which is about half the rate for the first 30 days. Holding potatoes for the first 2 weeks of storage at temperatures of from 56° to 60° decreases shrinkage to about 20 percent below average, while holding during the early period between 40° and 46° increases shrinkage to 20 percent above average. Within the range of temperature and humidities studied potato shrinkage increases uniformly with increases in saturation deficit. Condensation of moisture in the wall-circulation space has been an unrecognized factor in the control of storage conditions and a recognized factor in building depreciation. Such condensation tends to make storage temperatures uniform and removes moisture from the air automatically, and if waterproof wall-circulation surfaces are provided will not increase the building depreciation rate. Walls and ceilings having high insulation resistance permit the carrying of high relative humidities, while high relative humidities cannot be carried where wall- and ceiling-insulation resistance is low. Day ventilation (warmer outside air) tends to remove more moisture for a given amount of heat, so is desirable in the winter when there is little heat to spare. Night ventilation (colder outside air) tends to remove less moisture for a given amount of heat, so is desirable for fall or spring ventilation when potatoes must be cooled by ventilation. Limiting wall-insulating values are reached when the necessity of removing surplus heat by ventilation results in lower humidities than would be obtained with a lower insulating value.

[Agricultural engineering investigations by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 360 (1938), pp. 28, 29, 39, 40, fig. 1*).—Progress results are briefly presented of investigations on the mechanical dehydration of hay, and on soil conservation (coop. U. S. D. A.).

Time- and labor-saving equipment for the laying house, D. C. KENNARD and V. D. CHAMBERLIN (*[Ohio Sta.] Spec. Circ. 51 (1938), pp. 8, figs. 7*).—Satisfactory simple types of feeders, watering devices, box nests, droppings pits, self-closing partition doors, and an automatic time-switch device for lighting the laying house are described and illustrated.

Terracing, an important step in erosion control, M. CLARK and J. C. WOOLEY (*Missouri Sta. Bul. 400 (1938), pp. 47, figs. 21*).—This bulletin gives practical information, pointing out that the terrace best suited to agriculture in Missouri consists of a combination of a ridge of soil and a channel built sufficiently wide, on moderate slopes, to be crossed easily with farm implements. It is constructed by placing earth above the ground line in a ridge at right angles to the land slope, with most of the earth taken from a broad channel cut on the uphill edge of the ridge. Terraces are spaced on the slope so as to prevent excessive soil movement between them where a good supply of organic matter is kept in the soil. It must be built with sufficient height to prevent run-off water overtopping it, and given just enough grade in the channel to allow excess run-off water to flow from the field at a nonscouring velocity.

[Agricultural engineering investigations by the Idaho Station], H. BERESFORD (*Idaho Sta. Bul. 225 (1938), pp. 15-20*).—A brief review is given of investigations on operating costs for producing peas, farm costs for power and machinery operation, rural electrification, and the use of models for the testing of building design.

Study of rural housing, D. G. CARTER (*Arkansas Sta. Bul. 364 (1938), pp. 31 figs. 12*).—This bulletin presents an analysis of results obtained in a study of more than 200 farm homes, located in 67 counties of Arkansas, and which were built with a contribution of home labor and local material resources.

A positive correlation was found between family size and house size and between annual income and expenditure for housing. The proportion of home labor used decreased as the cash expenditure increased. Labor and material costs were divided as follows: Cash spent for labor 11.2 per cent, contributed labor 21.8, cash spent for materials 33.2, and native materials value 33.8 percent.

Effect of degree of slope and rainfall characteristics on runoff and soil erosion, J. H. NEAL. (Univ. Minn.). (*Agr. Engin., 19 (1938), No. 5, pp. 213–217, figs. 10*).—The results of a study of factors affecting erosion are presented as obtained in a miniature laboratory-controlled field on which the degree and length of slope, the rainfall intensity and duration, and the soil conditions were regulated or measured. Rainfall intensities of 0.9, 1.5, 2, 3, and 4 in. per hour were employed. The slope was varied between 0 and 16 percent, usually by geometric progression.

Infiltration was not affected by either the slope or the rainfall intensity, but varied inversely as the initial soil moisture content. Percentage of slope had no apparent effect on the percentage of run-off for slopes above 1 percent. Percentage of run-off increased as the rain intensity increased, but at a decreasing rate. When the soil was dry before a rain, run-off did not occur until several minutes after the rain started. The time elapsing between the beginning of the rain and the time when run-off occurred decreased as both the slope and the rain intensity increased. After run-off started there was a continual increase in the rate until the infiltration rate had become approximately constant. This occurred from 1 to 2 hr. after the beginning of the rain. Density of the run-off material decreased during the first hour of a rain, and when the rain continued longer the density remained approximately constant. From one and one-half to two times as much run-off was required to remove a pound of soil at the end of 1 hr. as at the beginning of the rain. Relative density of the run-off material increased as both the slope and the rainfall intensity increased. Soil losses from a saturated soil increase as the 0.7 power of the slope, the 2.2 power of the rain intensity, and directly as the time of duration of the rain. The amount of erosion from a soil which was in a dry condition at the beginning of the rain was affected by the initial soil moisture content and the condition of the soil surface, in addition to the degree of slope, the rain intensity, and the duration of the rain.

A soil in a dry, pulverized condition, or one in a dry, rough condition will absorb much more rainfall than one in a smooth, hard, baked condition.

Results of field tests on small combines, G. W. MCCUEN and E. A. SILVER. (Ohio State Univ. and Expt. Sta.). (*Agr. Engin., 19 (1938), No. 5, pp. 207–210, figs. 5*).—This study showed that width of cutter bar is not always the limiting factor of the capacity of the combine. On the basis of tonnage per foot cutter bar, machines with short cutter bar showed high capacity. There was little difference in the efficiency of machines of various sizes, and the small machines following adjustment showed as high efficiency as the larger or 10- or 12-ft. sizes and in many cases higher efficiency. Excessive cutter bar loss was responsible in most cases for low over-all efficiency. The size of machine based on the width of cut had little or no effect on grain losses, and some of the smaller sizes had lower grain losses than some of the larger ones.

Relation of permeability to moisture and durability of paint systems, W. W. KITTELBERGER (*Indus. and Engin. Chem., 30 (1938), No. 3, pp. 328–333, figs. 7*).—In an investigation of the durability of various priming and three-coat painting systems on wood it was found that the initial permeability to moisture alone cannot be considered a criterion of the protection rendered by such a system on prolonged exposure. The permeability to moisture of the ordinary multicoat paint system is low, and when weathered was found not to increase appreciably until breaks in the film enabled moisture to enter the wood.

A complete water-disposal plan using vegetation in terrace outlets, J. M. DOWNING. (U. S. D. A.). (*Agr. Engin., 19 (1938), No. 5, pp. 211, 212, fig. 1*).—A water disposal plan is briefly described which utilizes vegetation as the principal control measure.

Depreciation of farm electric equipment, T. E. HIENTON. [Ind. Expt. Sta.]. (*Agr. Engin., 19 (1938), No. 5, pp. 205, 206, 210, fig. 1*).—This study related to the depreciation of electric motors in farm use and to electrically driven farm equipment. Information was obtained from 111 Iowa farms and 69 Indiana farms on which electric service had been available for more than 10 yr.

From the standpoint of depreciation, equipment driven by motors included in the study ranked in the order: Water pump, washing machine, vacuum cleaner, cream separator, refrigerator, grain elevator, milking machine, fan, feed grinder, and feed grinder and elevator. Motor retirements were greatest on water pumps, followed in order by washers, feed grinders, grain elevators, utility, cream separators, milking machines, and refrigerators. Wear was found to be the most common factor causing retirement. From the results obtained, it is considered probable that electrical motors properly selected as to size and type, installed with proper wiring and overload protection, and serviced with regard to lubrication and bearings will last almost indefinitely on farm equipment.

Modern connectors in wood construction, J. A. SCHOLTEN. (U. S. D. A.). (*Agr. Engin., 19 (1938), No. 5, pp. 201–203, figs. 4*).—Modern connectors used in wood construction are described and illustrated as developed and tested by the Forest Products Laboratory.

Structural analysis of roof truss design, W. ARRINGTON. (Idaho Expt. Sta.). (*Agr. Engin., 19 (1938), No. 5, pp. 199, 200, 204, figs. 3*).—An analytical discussion is presented of barn roof truss design as developed by the station.

Control of moisture and temperature in potato storages, A. D. EDGAR. (U. S. D. A.). (*Agr. Engin., 19 (1938), No. 9, pp. 399, 400*).—The purpose of this brief contribution is to discuss a basis for the design and operation of common potato storages adapted to regions where the average winter temperature is from about 20° F. downward.

It was found that temperature and moisture control in northern potato storages mainly by conduction of heat and condensation of moisture upon waterproofed surfaces is better than control mainly by ventilation. This is because better control is secured which results in reduced potato shrinkage, control is partly automatic so requires less attention of the storage operator, less artificial heat is required, and condensation of moisture within the storage adds very little to conduction loss, but about 1,000 B. t u. of heat is lost with each pound of moisture removed by ventilation in addition to conduction loss.

Temperature and moisture control by condensation would not seem applicable to the southern area where conduction losses are low and emphasis must be placed upon the removal of heat. No sharp division line can be drawn between the northern and the southern area, but in areas where the average winter temperature is 20° there will probably be little difference which system of storage control is used.

Temperature of soil heating cable in three different media, J. E. NICHOLAS. (Pa. Expt. Sta.). (*Agr. Engin., 19 (1938), No. 9, p. 404, fig. 1*).—Studies are briefly reported which showed that a cable placed on top of the growing soil eliminates the use of drainage provision and the regularly recommended use of insulation for the bottom of the bed. It simplifies the use of the heating cable, and the cost of operation is reduced. It was found that the temperature of the cable placed 4 in. in the soil reached from 130° to 132° F., whereas the temperature of the same cable placed on top of the soil seldom exceeded 100°.

Recommended practice for use of sunlamps in animal and poultry husbandry, L. LLOYD (*Agr. Engin., 19 (1938), No. 9, pp. 401–403*).—Data regarding methods of using sun lamps for poultry and livestock are presented which were obtained from experience with several hundred actual installations.

Precooling vegetables by water spray, R. L. Perry. (Calif. Expt. Sta.). (*Agr. Engin., 19 (1938), No. 9, pp. 397, 398, figs. 2*).—Studies on the precooling of vegetables by water spray are briefly presented which show that (1) water-cooling units require only from 10 to 16 min. as compared to 8 to 14 hr. for portable air-cooling units, (2) the higher resultant humidities tend to favor freshness, and (3) reasonable sanitation must be practiced if decay from contamination spread by dirty water is to be avoided.

Simplified determination of the safe yield of a groundwater basin, G. E. P. Smith and J. C. Hiller. [Ariz. Expt. Sta.]. (*Agr. Engin., 19 (1938), No. 9, pp. 395, 396, 398, figs. 3*).—This brief contribution describes the measurement of the safe annual yield of a ground water basin with a fair degree of accuracy, at low cost, in a period of 2 yr.

The relation of mechanical harvesting to the production of high-grade cotton, C. A. Bennett. (U. S. D. A.). (*Agr. Engin., 19 (1938), No. 9, pp. 386–388. figs. 3*).—The principal kinds of mechanical cotton harvesters are described in their relationship to the ginning out of high grade cotton.

It is pointed out that sleds having comb-like bottoms, used occasionally in the past with large crops but obsolete now, were the crudest form of harvesters. Strippers, with or without attachments, mark an improvement over sleds; and mechanical pickers, which are the oldest inventions of the group, with or without attachments, harvest cotton in better condition than do strippers. Mechanical harvesters such as strippers and spindle pickers have thus far produced seed cottons in which leaf and other particles of foreign matter have become entangled in such a manner as to be difficult of removal by cleaning equipment in the gins.

The results of ginning experiences with mechanically picked cotton have not been encouraging. On the average the spindle pickers have produced lint from one to two or more grades lower than that from corresponding hand pickings.

The conclusion is drawn (1) that the goal of producing mechanically harvested, high-grade cottons with present-day pickers and gins has not been reached, despite the increasing number of encouraging developments that have occurred from time to time, (2) that the ginning industry has yet to find a satisfactory means for overcoming the difficulties presented in the ginning of mechanically picked cottons of existing characteristics, and (3) that the cotton breeders must develop new strains of cotton varieties which, by special characteristics, will especially make for better pickability on the part of mechanical pickers. The problem is therefore threefold and falls within the fields of activity of the cotton breeder, the manufacturer of harvesting machinery, and the cotton ginner.

Mechanical cotton harvesting experience in California, H. B. Walker [Calif. Expt. Sta.]. (*Agr. Engin., 19 (1938), No. 9, p. 392*).—Tests of a revolving finger type of cotton picker indicate fairly successful operation, the most serious drawbacks being ground shatter. In the first test this was 17.3 percent, but changes in the machine reduced it to 8.75 percent. If it could be reduced to 5 percent or less, the performance would be more encouraging. This machine does not seriously injure the green plants, although approximately 16 percent of the green bolls were knocked from the plants.

Progress in mechanical harvesting of cotton, H. P. Smith. (Tex. Expt. Sta.). (*Agr. Engin., 19 (1938), No. 9, pp. 389–391, figs. 2*).—This is a brief historical review of research at the Texas Experiment Station on the development of equipment for the mechanical harvesting of cotton.

Wiring the farmstead, F. C. Fenton and H. E. Stover (*Kans. State. Col. Ext. Bul. 63, rev. (1938), pp. 52, figs. 43*).—This is a revision of a bulletin previously reported (E. S. R., 61, p. 880). It brings up to date practical information on the wiring of farm buildings and equipment for electrical service, all of which is presented in accordance with the National Board of Fire Underwriters Code.

AGRICULTURAL ECONOMICS

[Articles and notes on agricultural economics] (*Jour. Farm Econ., 20 (1938), No. 2, pp. 403–416, 430–447, 462–516, fig. 1*).—In addition to articles noted elsewhere are the following: Market Prorates and Social Welfare, by F. V. Waugh (pp. 403–416); The Soil and the Law—I, by P. M. Glick (pp. 430–447); Economic Aspects of Land Conservation, by S. von Ciriacy-Wantrup (pp. 462–473); and Agrarian Reorganization in the South, by C. B. Hoover (pp. 474–481); and notes on A National Audit of Farm Output Needed, by K. Brandt (pp. 482–484); Serial or Coherent Correlation in Price Series, by L. F. Knudsen (pp. 484–488); Relief Data as Criteria of Submarginality, by P. H. Landis (pp. 488–494); Some Theoretical Aspects of Controlled Marketing, by J. M. Thompson (pp. 495–503); Depopulation of Louisiana's Sugar Bowl, by T. L. Smith (pp. 503–509); and Farm Land Appraisal in Italy, by D. Salomone (pp. 510–516).

[Investigations in agricultural economics by the North Carolina Station, 1936 and 1937]. (Partly coop. U. S. D. A.). (*North Carolina Sta. Rpts. 1936, pp. 28, 29, 56, 57; 1937, pp. 20–22, 22–25, 47, 78, 79*).—In the report for 1936, a table by G. R. Smith and R. H. Raper shows the average percentages of grades and staple lengths of cotton ginned in the Tidewater, Upper Coastal Plain, and Piedmont regions, 1935–36. Some findings as to cotton marketing practices during the 1935–36 season in four marketing areas of the Coastal Plain area based on a study by Smith are included, as well as cost of production studies with poultry, by R. S. Dearstyne.

In the report for 1937, a table by G. W. Forster and R. E. L. Greene summarizes the data regarding land use, capital, receipts, expenses, labor income, and returns on capital in 1928, 1930, and 1934 obtained in a study of farms operated by cropper labor in Edgecombe, Lenoir, Pitt, and Wayne Counties. A table by Greene and C. D. Grinnells shows the yields of different crops by years 1929–32 and 1934–36 on different fields in a dairy-crop utilization project. A table shows the average amount of land in crops, other land, capital investment, receipts, expenses, labor income, return on capital, etc., in 1935 on 172 Franklin County and 136 Wilson County farms studied by Greene and O. Wakefield. A table by Smith and Raper shows the average staple length of cotton in North Carolina and the United States by years 1928–36 and the text discusses the changes in North Carolina. Cost of egg production studies by Dearstyne are tabulated.

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 193 (1938), pp. 149–152*).—An article by C. G. McBride on Factors Causing Variations in Milk Returns includes a table showing for each of 56 farms in northern Ohio for the calendar year 1936 the range in butterfat, average returns per 100 lb. of milk at the farm on the basis of actual butterfat tests and adjusted to 3.5 percent butterfat, the cost of hauling milk, and the average returns at market on the 3.5 percent butterfat basis. The factors causing the variations in returns are discussed briefly. The table of index numbers of production, prices, and income, by J. I. Falconer (E. S. R., 79, p. 692), is brought down through April 1938.

Proceedings of the eighth annual meeting of the Canadian Society of Agricultural Economics, Fredericton, N. B., 1936 (*[Ottawa], 1936, pp. [5]+90, figs. 3*).—Included are the following papers with discussions thereon presented at the meeting held at the University of New Brunswick July 14–16, 1936: Canadian Agriculture and the Depression, by J. F. Booth (pp. 1–12); The Rural Sociologist—His Point of View and Fields of Interest, by C. A. Dawson (pp. 13–17); University Courses in Agricultural Economics, by J. Coke (pp. 18–29); The Need for Co-ordination in Research in Agricultural Economics, by J. B. Rutherford (pp. 30–36); Unemployment in Relation to Agriculture, by G. V. Haythorne (pp. 37–44); Rural Population Movements, by J. E. Lattimer (pp. 45–52); Co-ordination in Agricultural Services, by G. S. H. Barton (pp. 53–59); An Agricultural Policy—Production, by F. W. Walsh (pp. 60–64); An Agricultural Policy—Marketing, by W. C. Keirstead (pp. 64–72); Land Tenure in Quebec, by C. Gagne (pp. 73–78); and The Operations of the Canadian Farm Loan Board in Quebec, by J. Proulx (pp. 79–86).

State legislation on planning and zoning. (Coop. U. S. D. A.). (*Natl. Resources Com. Circ. 12 (1938), pp. [1]+III+60, pls. 3*).—This is a compilation by States of State legislation on planning and zoning.

The future of State planning: National Resources Committee, March 1938 (*Washington: Govt., 1938, pp. VII+117, figs. 8*).—The development and present status of State planning, the functions and opportunities of State planning boards, their position in the governmental structure of the States, and their relationships with the National Resources Committee are discussed. An appendix includes a directory of members of State planning boards and a bibliography by States of publications.

Current programs of work: State planning boards (*Natl. Resources Com. Circ. 11 (1938), pp. [1]+38*).—Included are statements by States of the current programs likely to be completed by the end 1938.

Rural land use activities in Missouri, R. J. Silkett. (Coop. U. S. D. A.). (*Missouri Sta. Bul. 399 (1938), pp. 18, fig. 1*).—The activities of the different States and Federal agencies in Missouri are described.

Land utilization in China, [I–III], J. L. Buck (*Chicago: Univ. Chicago Press, 1937, [vols. 1], pp. XXXII+494, [pls. 28], [figs. 88]; [2], pp. XII+146, [figs. 200]; [3], pp. XV+473+[1]*).—This study had three purposes, "first, to train students in the methods of research in land utilization; second, to make available knowledge of China's agriculture, for its improvement and as a basis of national agricultural policies; and third, to make available to people of other countries interested in China's welfare certain elementary information about land utilization, food, and population in China." It is based upon the sample consisting of 16,786 farms in 168 localities and 38,256 farm families in 22 provinces. Included in Volume 1 are chapters on Chinese Agriculture (pp. 1–22), Agricultural Regions (pp. 23–91), The Land (pp. 162–203), Crops (pp. 204–244), Livestock and Fertility Maintenance (pp. 245–266), Size of Farm Business (pp. 267–288), Farm Labor (pp. 289–310), and Marketing (pp. 348–357). all by J. L. Buck; Topography, by J. Hanson-Lowe (pp. 92–100); Climate, by B. Burgoyne Chapman (pp. 101–129); Soils, by J. Thorp (pp. 130–161); Prices and Taxation, by A. B. Lewis (pp. 311–347); Population, by F. W. Notestein and C. M. Chiao (pp. 358–399); Nutrition, by L. A. Maynard and W. Y. Swen (pp. 400–436); and The Standard of Living, by H. Brian Low (pp. 437–472)

Volume 2, Atlas, includes maps, figures, and photographs covering the regions of China, use of lands, tenure and kinds of tenancy, acreages, yields and production of different crops, numbers of livestock of different kinds, size of farms, data as to farm labor, prices, taxation, nutrition, and population. Volume 3 is a reference work for use in the areas surveyed and for research workers in making further analysis. The tables are grouped under the following headings: Climate, the land, nutrition, livestock and fertility maintenance, prices and taxation, crops, size of farm business, farm labor, marketing, the standard of living, population, and sources of information. Tables, legends, and descriptive matter in volumes 2 and 3 are in Chinese and English, and the volumes are planned for independent use or in conjunction with volume 1.

Soil conservation from a land-use viewpoint, J. S. Cutler. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 6, pp. 520–528*).—Soil conservation v. soil deterioration, land use as applied to agricultural lands, factors influencing land use, relation of soil conservation and land use, actual v. ideal land use, and readjustment of land use on individual farms are discussed.

Foreign Agriculture, [August–September 1938] (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr., 2 (1938), Nos. 8, pp. 351–388, figs. 4; 9, pp. 389–436, figs. 7*).—No. 8 includes articles on Cotton Growing in the Soviet Union, by L. G. Michael (pp. 353–382), and Farm-Labor Shortage in Germany, by H. Richter (pp. 383–385), and notes on recent developments in foreign agricultural policy as follows: South Australia considering wheat-marketing plan, Algeria to regulate production of citrus fruit, Yugoslav government to sponsor land-conservation projects, Argentina considering regulation of fruit and vegetable industry, and Mexican producers to control stocks of ixtle fiber. No. 9 includes articles on The Chinese Textile Industry and American Cotton, by F. J. Rossiter and W. Ladejinsky (pp 391–408), Farm Aid in Poland, by H. H. Conrad (pp. 409–432), and Recent Developments in British Agricultural Policy, by P. G. Minneman (pp. 433–436).

Legislation regarding commerce in plants in different countries, A. Brizi (*La Législation du commerce des plantes dans les différents pays. Roma: Inst. Internatl. Agr., 1938, 2. ed., pp. XVI+363*).—The legislation and regulations regarding importation and exportation are given for 61 countries.

The trade agreements program and Michigan agriculture, M. C. Gay (*Michigan Sta. Quart. Bul., 21 (1938), No. 1, pp. 3–12*).—The relation between American agriculture and the American tariff, the effects of trade agreements on imports of farm products into the United States, the direct and indirect effects on agriculture, especially that of Michigan, of the agreements, etc., are discussed.

Proceedings of the Rural Group Sessions, National Appraisal Forum, held under the auspices of the Joint Committee on Appraisal and Mortgage Analysis, Washington, D. C., November 19 and 20, 1937, compiled by L. G. Porter (*Washington, D. C.: Joint Com. Appraisal and Mortgage Anal., 1938, pp. [1]+III+84, [pls. 6]*).—Included are the following papers presented at the forum: Survey of Rural Real Estate Appraisal Data Sources, by L. G. Porter (p. 6) Catalog of Urban Real Estate Appraisal Data Sources, by A. J. du Bois (pp. 8, 9); Soil Survey and the Appraisal Problem, by C. E. Kellogg (pp. 10–16); Production Statistics and Aerial Surveys, by W. F. Callander (pp. 17–21); Insects and Insect Pests, by J. A. Hyslop (pp. 22–25); Farm Family Living Costs, by D. S. Brady (p. 27); Weather Cycles, by J. B. Kincer (pp. 29–33); Valuation and Land Utilization, by B. R. Stauber (pp. 34–37); Farm Mortgage Data, by N. J. Wall (pp. 38–42); Crop Insurance for Wheat, by W. H.

Rowe (pp. 43, 44); Mortgage Record Data, by R. C. Limber (pp. 49–51); Farm Management Data, by D. H. Doane (pp. 53–56); The Consumption of Data, by D. W. Trick (pp. 57–60); Crop Yields, by W. G. Murray (pp. 62–67); Soils, by E. E. McAnelly (pp. 69–71); Weeds and Weed Pests, by E. Liggett (pp. 72–76); Engineering Data, by W. R. Parkhill (pp. 77–80); and Prices and Price Levels, by R. H. Cole (pp. 81–84).

Montana farm bankruptcies, R. R. Renne (*Montana Sta. Bul. 360 (1938), pp. 53, figs. 23*).—This is "a study of the number, characteristics, and causes of farm bankruptcies over a 40-yr. period with some suggestions for preventing them in the future." The farm credit problems of the State and the bankruptcy procedure are described. An analysis is made of the number and trends of Montana farm bankrupties during a 40-yr. period, with comparisons with the United States, neighboring States, and other occupations, and of the causes of the Montana farm bankruptcies. Suggestions are made for improvement of the farm loan policies in the State.

In the last 40 yr. nearly 3,900 Montana farmers went bankrupt, approximately two-thirds during the period 1922–26. Creditors lost more than $40,000,000. Real estate mortgages on the bankrupt farms averaged $15.38 per acre as compared with $6 on all mortgaged farms in the State, and averaged 1.75 times the long-time productivity value of the land, as compared with less than two-thirds for all mortgaged farms. The percentage of tenants becoming bankrupt was from 2 to 5 times as great as that of owners. The bankrupt farms were considerably below the average in size. Bankruptcies were highest in the dry farming areas where development was most rapid during the years of rising prices and soaring land values in the decade prior to 1920. Bankruptcies have been low since 1930 due to lack of alternative opportunities in industry, debt adjustments and moratoria, and government expenditures and relief. Methods suggested for reducing farm bankruptcies and failures are (1) the basing of loans on productivity value of lands determined by scientific soil surveys and average yields and prices; (2) tax assessments on the basis of such values; and (3) adjustment of annual repayment on loans to current income and buying power rather than dollars.

Homestead tax reduction in Iowa, C. W. Thompson and V. McElroy (*Iowa City: State Univ. Iowa, Bur. Business Res., 1937, pp. 89*).—Facts concerning the proposals offered in Iowa for homestead tax refund and tax exemption are presented, and an analysis is made of the act effective March 26, 1937. Some tentative observations are also made on the legal and economic phases of the problem.

Types of farming research and farm management, W. W. Wilcox. (Iowa Expt. Sta.). (*Jour. Farm Econ., 20 (1938), No. 2, pp. 417–429*).—Types-of-farming research to date is surveyed and evaluated, and its accomplishments, shortcomings, and probable future trend are discussed.

Farm practices and their effects on farm earnings, M. L. Mosher and H. C. M. Case (*Illinois Sta. Bul. 444 (1938), pp. 469–604, figs. 20*).—Using farm accounts and records of practices used in the production of crops and livestock by members of the Illinois Farm Bureau Farm Management Service in north-central counties of the State from 1925 to 1934, comparisons are made of specific practices in the production of corn, oats, beef and dairy cattle, hogs, and poultry, and an analysis is made of the records kept throughout the period on a group of 57 selected farms to determine the factors responsible for differences in farm earnings and the interrelationship of these factors in the general organization and operation of a farm. The study of corn and oats production involved records for 1 yr. or more on approximately 1,000 farms. The livestock production involved approximately 800 farms. An appendix describes the practices followed on the farms with the highest corn and oat yields, the most profitable dairy herds, and successful beef-cow herds, by stockmen purchasing feeder cattle and successful swine and poultry producers, and to keep down labor, power, and machinery costs.

Some of the findings in the study of practices were: The average gain in yield of corn from the use of good practices was 31.4 bu. per acre. Soil treatment practices accounted for 11.7 bu., good cultivation on well-treated soils 9.9 bu., and practices having to do with kind, selection, storage, and preparation of seed for 9.8 bu. Superior practices with oats resulted in average gains of 39.7 bu. per acre on well-treated land, 25.2 bu. on fairly well-treated land, and 17.5 bu. on poorly treated land. Beef from beef or dual-purpose cows brought considerably lower returns for feed fed than purchased feeder cattle when a fair farm value was assigned to the roughage consumed by the cow herds, including the roughage ordinarily considered unsalable. The lower returns from home-raised beef were to a considerable extent due to poor quality. The proportion of the herd being milked and the milk production per cow were about of equal importance in influencing returns for feed fed in dairy herds. Herds with 71.1 percent of all cows milked and an average production of 8,815 lb. of milk per cow returned $168 per $100 worth of feed fed as compared with $107 in herds where only 43.5 percent of the cows were being milked and the average production per cow was only 6,107 lb. of milk. Farmers following the better practices with hogs had an average return of $33 (32 percent) more per $100 worth of feed fed than did other farmers. Poultry returned on an average $119 (80 percent) more per $100 invested in the flock when pullets were hatched in February and March and fed a laying mash throughout the year than when they were hatched in May or June and fed a laying mash only during part of the year or not at all. The better managed flocks averaged 117 eggs per hen per year as compared with 81 eggs for the less profitable flocks.

The average annual differences in net income between the 19 least and the 19 most profitable of the 57 farms studied for the 10-yr. period was $1,673. Of this difference 28 percent was found to be due to crop yields, 23 percent to efficiency of livestock, 15 percent to amount of livestock, 11 percent to the cropping system, 10 percent to the prices received for grain (about 55 percent of grain produced was sold), 8 percent to miscellaneous expenses, 4 percent to acreage costs for horses, machinery, and equipment, and 1 percent to acre costs for labor, including that of operator and family. Ten farms on which the most improvements in practices were made earned approximately $1,500 more per year at the end of the period than during the first 3 yr.

Citrus enterprise-efficiency studies in southern California, A. Shultis (*California Sta. Bul. 620* (*1938*), *pp. 65+*[*13*], *figs. 3*).—This bulletin summarizes and presents data as to lemons and navel and Valencia oranges, obtained by the agricultural extension service in enterprise-efficiency studies in seven counties from 1928 to 1936. The factors influencing net income—factors affecting yields, prices, costs, etc.—are discussed. Analyses are made of the cultural costs, cash-overhead costs, investment, depreciation, interest on investment, and returns from mature orchards and of the costs in young orchards. The effects of yields on costs and net income and future yields, prices, and costs, and valuation and size of orchards are discussed. A standard of costs for oranges and lemons is worked out.

Net income is dependent upon yields per acre, price of fruit, and costs per acre, of which yield per acre is the more likely to account for large differences. The recent increase in bearing acreages has been such that in years of heavy total production, fruit cannot be sold at prices profitable to the majority of growers. With careful management, adequate cultural care need not cost over $200 per acre in mature orchards yielding 240 packed boxes per acre, and at current prices this would leave a net income as a return to capital invested and a reward for management. "Present and probable future orange prices will support the present valuation of high-producing orchards. Orchards with average or moderate yields can only earn a return on a lower value per acre than that which prevailed before the depression. Orchards with very low yields owing to environmental or cultural handicaps will have little or no agricultural value." As to young orchards, the author states that "with interest on the unproductive investment during the waiting period included, trees will have cost about $1,000 an acre by the time they reach the profitable bearing age of 20 yr. With this long waiting period and with the large investment required, the planting of additional acreage to citrus fruits does not appear profitable considering prices as they are. . . . A working owner can do most of the work, except that usually hired on a contract basis, on any orchard up to about 20 or 25 acres. Under current and probable future prices about 20 acres free of debt are required to provide a working operator with a personal income of $2,000."

Cost of producing apples and peaches in Illinois, 1932 to 1936, P. E. JOHNSTON. (Ill. Expt. Sta.). (*Ill. State Hort. Soc. Trans., 71 (1937), pp. 380–386*).—Tables are included showing the investment, expenses, income, etc., during the period 1932–36 and for the year 1936 in orchards in southern and western Illinois for which records were obtained.

Agricultural production in New York, 1866 to 1937, T. E. LAMONT (*[New York] Cornell Sta. Bul. 693 (1938), pp. 34, figs. 27*).—Tables and charts are included showing by years or periods the changes during the past 60 yr.

Land in farms decreased 4,200,000 acres in 55 yr., but agricultural production increased 20 percent due to the use of fertilizers and lime on good land, improved varieties of crops, better control of diseases and insects, more legumes, higher-producing cows and hens, better feeding, and disease control of livestock. Production per acre except fruits increased 21 percent from 1899 to 1934. Milk production per cow more than doubled from 1864 to 1934. Production per man nearly doubled in the 60 yr. The average annual value of all crops, 1926–30, was $208,000,000, of which hay comprised 33 percent, potatoes 14, corn silage 11, and apples 10 percent. The average gross income, 1926–30, from crops and livestock sold or used was $361,000,000, of which milk amounted to 47 percent, eggs 11, potatoes and other vegetables 14, and fruit 8 percent. The value of products sold or used in land classes I and II was less than 4 percent of that for all farms in the State.

The Colorado range cattle industry, O. B. PEAKE (*Glendale, Calif.: Arthur H. Clark Co., 1937, pp. 357, [pls. 9]*).—Appendixes to this history include tables of palatability of range plants; cost of running cattle; bylaws, resolutions, etc., of stockgrowers' associations; and lists of State and local associations. A bibliography is also included.

Economic studies of dairy farming in New York.—XIII, 100 grade A farms in the Tully-Homer area, crop year 1936, E. G. MISNER (*[New York] Cornell Sta. Bul. 696 (1938), pp. 59, figs. 20*).—This is the fourth bulletin in the series previously noted (E. S. R., 75, p. 866) giving incomes on farms in the area at 5-yr. intervals. The area and prices and weather conditions during the year are described. Tabular data are included and discussed, and an analysis is made of the effects of various factors.

The average capital per farm was $19,301, of which 64 percent was in real estate and 22 percent in livestock. Of the total receipts, 15 percent was from crops and 66 percent from milk and milk products sold. The average labor income was $1,049 and the value of operator's privileges $470. The average return on capital when the value of operator's time and privileges was considered was 6.2 percent.

Labor income was increased as follows: One additional cow, $42; each additional 100 lb. of milk produced per cow, $42; one additional point in crop index compared with the 10-yr. State average, $15; 1 percent increase in receipts from crops sold, $51; and 1 ton more milk per man, $61. Farms with none of these factors as good or better than the average had average labor incomes of $35; those with one as good or better than the average, $98; those with two, $794; those with three, $1,360; those with four, $3,387; and those with all five, $4,202. A farm-management-efficiency program outlined for a well-organized business includes the following: For a 2-man dairy, 25 or more cows, 700 or more productive-man units, and usually a capital of more than $15,000; at least 3 minor sources of income or more than $500; not to exceed 2 acres of crops per animal unit except where much grain or cash crops can be grown; premiums for grade A milk, eggs, poultry, and other products; more than one-fifth of the income from the sale of crops or premiums; annual production of 7,000 lb. or more of milk per cow; cattle sales and increases of more than $15 per year per cattle unit; more than 140 eggs per hen when poultry is a minor source of income; crop yields from 25 to 80 percent above the 10-yr. State average; a labor efficiency that will give 30 acres or more of crop land, at least 15 animal units except work stock, 40 tons of grade A or 50 tons of grade B milk and a gross income when prices are about 140 percent of the pre-war level of more than $3,000 per man; receipts at least 4 times the value of all labor, including operator's time; a capital turn-over sufficiently rapid that receipts will equal capital in 3 yr. or less; and less than 65 percent of the capital invested in real estate.

Ohio appraises its potato industry: A progress report, C. W. Hauck (Ohio State Univ.). (*Ohio Veg. Growers Assoc. Proc., 23 (1938), pp. 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148*).—Tables are included and discussed showing the defects and undersized potatoes found in 1936 and 1937 in a study of late-crop potatoes. The relationships of cultural practices to yield and grade and the marketing of potatoes are also discussed.

Soybeans in the United States; recent trends and present economic status, E. W. Grove (*U. S. Dept. Agr., Tech. Bul. 619 (1938), pp. 31, figs. 9*).—The development of the soybean industry, production in the United States, the world market and the position of the United States in it, and the volumes of soybean oil and meal produced are described with tables and charts. The factors affecting the price of soybeans, the demand for soybean oil and meal, the elasticity of the demand and the supplies, and the increases in acreage and production of soybeans in the United States are discussed.

Grading wool, J. W. Christie (*U. S. Dept. Agr., Farmers' Bul. 1805 (1938), pp.* [2]+*24, figs. 14*).—This includes information regarding the wool industry in the United States, imports, quality of wool, grades, official standards, etc.

Oregon's problem in marketing agricultural and industrial products, W. J. Kerr (*Portland: Oreg. State Bd. Higher Ed.,* [*1938*], *pp. 76, figs. 6*).—The purpose of this bulletin is "to discuss in brief the nature and extent of Oregon's marketing problems, particularly in the field of agriculture, and to show the regional relationships of these problems as revealed by the investigation", and it "summarizes these findings and makes recommendations for the establishment of a permanent service within the State System of Higher Education designed to afford continuing leadership in marketing." The facts as to foreign trade of the United States, the Northwestern States and Oregon, agricultural and nonagricultural marketing, marketing developed in California, and the present marketing conditions in Oregon and Washington are described. The major needs in Oregon—greater efficiency in production, more effective coordination of production and market demands, greater efficiency in marketing, and more effective marketing organizations—are discussed. It is recommended that a division of agricultural and industrial marketing be established for research of marketing problems of the State.

Index numbers of prices received for Arkansas farm products, 1910–1937, W. T. Wilson and S. L. Bryan. (Coop. U. S. D. A.). (*Arkansas Sta. Bul. 363* (*1938*), *pp. 46, figs. 8*).—Tables and charts are included showing the monthly prices, August 1909–December 1937, received by Arkansas farmers for each of 25 of the most important farm products, the index numbers of these prices and of the prices of the products grouped as grains, cotton and cottonseed, fruits, dairy products, chickens and eggs, meat animals, and all products. The base period for index numbers is August 1909–July 1914, and that for the estimation of weights to be given the products in the groups and all product indexes the 6-yr. period 1924–29.

Prices of livestock and livestock products in Michigan, 1929–37, O. Ulrey (*Michigan Sta. Quart. Bul., 21* (*1938*), *No. 1, pp. 41–61, figs. 5*).—The tables and charts of monthly prices and indexes of such prices of different kinds of livestock and livestock products previously noted (E. S. R., 72, p. 124) are brought down through June 1938. Also included are tables and charts showing the monthly corn-hog and barley-hog ratios, January 1934–May 1938; the farm values and index numbers of purchasing power of beef cattle, hogs, sheep, horses, and milk cows, 1910–14, 1924–28, and by years 1929–38; and the weighted annual prices and index numbers, 1910–28, for sheep, lambs, wool, chickens, and eggs.

Monetary influences on postwar wheat prices, V. P. Timoshenko (*Wheat Studies, Food Res. Inst.* [*Stanford Univ.*], *14* (*1938*), *No. 7, pp.* [*2*]+*263–318, figs. 16*).—"The present analysis brings out important price-raising effects of monetary developments between 1924 and 1930. Unduly high levels of wheat prices during that period stimulated rapid expansion of wheat production and created disequilibrium between the supply and the demand for use. The ensuing price readjustment was deferred because speculative demand for wheat, stimulated by the same monetary factors, enabled surplus stocks to be carried for several years. . . . By 1935, gold prices of wheat began to react normally to changes in the supply-demand situation, but on a level considerably below that which prevailed before the depression. To bring the level of wheat prices in terms of gold up to the predepression level would require a sharp rise of general price levels that would involve danger of new price disequilibria."

Prices as related to quality on the Connecticut strawberry auctions, G. B. Clarke and R. G. Bressler, Jr. ([*Connecticut*] *Storrs Sta. Bul. 227* (*1938*), *pp. 32, figs. 12*).—This report is based on studies made of the New Haven strawberry auction in 1933 and the Manchester strawberry auction in 1935. The history of the strawberry and vegetable auctions in the State, and the organization and operation of and types of buyers at the two auctions are described. The seasonal, weekly, and daily cycles of sales and prices at the two auctions are discussed. An analysis is made as to the effects on prices of strawberries of average size, condition, uniformity, color and variety of berries, size of lot, and type of containers used. Some analysis is also made of the effect of changing qualities of various sizes of berries on the quality-price relationship.

Size of berries explained about 36 percent of the price variations at New Haven and 30 percent at Manchester; condition of berries 10 and 5 percent, respectively; uniformity of berries (percentage of berries ¼ in. or more smaller than the average) 2.5 and 1.5 percent, respectively; color about 1 percent on both auctions; and size of lot 0 and about 2 percent, respectively. The sales of Howard 17 berries and sales in 24-qt. packs were so predominant that no effects of variety and type of crate were ascertainable. The effects of the five quality factors together were about 50 percent at New Haven and 40 percent at Manchester.

The relation of quality to the retail price of eggs in Rhode Island, H. C. FOWLER (*Rhode Island Sta. Bul. 265 (1938), pp. 27, figs. 13*).—This study is based on 1,588 doz. eggs, of which 134 doz. were purchased from farmers and the remainder from retail stores in July, August, November, and December 1928, April and May 1929, November and December 1934, and April, May, July, and August 1935. The eggs were candled and graded by specialists, and a score card was devised as a means of expressing quantitatively the relative desirability of each dozen of eggs purchased. The method of scoring is described. An analysis is made of the relations of retail prices and source of eggs, size, depth of air cell, inedible factors, cold storage, processing, shell color, cleanliness, use of cartons, etc.

The retail prices of medium-sized eggs from nearby sources averaged 29 percent higher in 1928–29 and 27 percent higher in 1934–35 than those for medium-sized western eggs. The difference was probably due to the better quality of the former. Of the eastern eggs, 56.3 percent scored 80 or more and 67.6 percent had air cells ⅛-in. or less in depth as compared with 4.4 and 10 percent, respectively, for the western eggs. Prices for eastern eggs of the same score and same air cell depth were from 12 to 21 percent and from 15 to 21 percent higher, respectively, than those for western eggs. Eastern eggs scoring 90 or better sold for 17 percent more than those scoring from 50 to 59.9 and western eggs scoring from 80 to 89.9 were 11.5 percent higher than those scoring from 40 to 49.9. As to inedible factors, eastern eggs were only slightly better than western eggs. The average score for storage eggs was 61 as compared with 81 for eastern eggs and 65 for western eggs. The average price was 34 percent less than that for eastern eggs and 17 percent less than that for western eggs. The quality of processed eggs was equal to that of western eggs, but the latter sold for about 12 percent more. The term "fresh" as defined by the Rhode Island law was used for 53.9 percent of both eastern and western eggs. The average score of eggs marked fresh was two-fifths of a point lower in the case of eastern eggs and 2.2 percent lower in the case of western eggs than those not sold as fresh. The score of 26 doz. eggs with Rhode Island Special seals attached was practically the same as the average for the western eggs, but the average price was 7.2 percent higher. The price of large eastern eggs was 3.7 percent higher than that for medium eggs and 28.3 percent higher than for small or pullet eggs. The prices of 24-oz. eggs averaged 16.1 percent higher for eastern and 13 percent higher for western eggs than the prices of 21-oz. eggs. Other things being equal, shell color did not affect prices appreciably. Number of dirty eggs per dozen had little effect on prices. Eggs in cartons brought about 2.5 percent higher prices than uncartoned eggs. Eggs purchased from farmers were of better quality and lower in price than average eastern eggs purchased from stores.

A statistical study of wool prices, T. R. Hamilton (*College Station, Tex.: A. & M. Press, 1938, pp. 56, figs. 5*).—The sources of sheep and wool statistics, the accuracy of price quotations, sheep and wool production in the United States, grading of wool, and methods of marketing are described. An analysis is made of wool prices and demand.

The most important factors affecting annual wool prices were world wool production the previous year. the general price level, business activity, and the long-time trend, of which general price level was the most important. On an average, changes in factors produced changes in prices as follows: One point in the index of wholesale prices, 0.58 ct. per pound in the same direction; one point in business activity, 0.84 ct. in the same direction; and 10,000,000 lb. in world production, 0.32 ct. in the opposite direction. The following equation is presented for estimating prices:

$$X_1=78.6733+0.5765X_2+0.8480X_3-0.3164X_4+1.9849X_5,$$

in which X_1 equals the price of wool at Boston, 56's Territory scoured; X_2, the U. S. Department of Labor, Bureau of Labor Statistics, index of wholesale prices; X_3, the Cleveland Trust Company index of business activity; X_4, the world wool production previous year; and X_5, the time (years numbered consecutively from 1900). It was found that the United States production of sheep follows a cycle of about 10 yr. and lags from 2 to 10 yr. behind prices, that world production the previous year has a greater effect on the domestic price of wool than production in the current year, that world production has a greater effect than domestic production on the market in the United States, that demand factors are more important price-fixing influences than production, that variability of wool prices between months is very likely due to chance, and that margin between prices of different grades is affected greatly by the relative supplies of the different grades.

Year book of agricultural co-operation, 1938, edited by The Horace Plunkett Foundation (*London: P. S. King & Son, 1938, pp. VI+564*).—This volume includes articles on Agricultural Cooperation in 1937; Count Alexander Karolyi—Founder of the Hungarian Cooperative Movement, by K. Ihrig; Cooperation and the Nutrition of Colonial Peoples, by H. A. Izant; Cooperation and Rural Hygiene; and articles by different authors on cooperation in various countries. The legislation during the year is reviewed. A list of publications during the year and a selected bibliography are also included.

A survey of farmers' cooperative marketing and purchasing associations in Missouri, H. M. Haag. (Mo. Expt. Sta.). (*Southwest. Social Sci. Quart., 18 (1938), No. 4, pp. 310–321*).—This is a general discussion of the findings in Missouri Experiment Station Bulletin 389, previously noted (E. S. R., 78, p. 416).

Crops and markets, [July–August 1938] (*U. S. Dept. Agr., Crops and Markets, 15 (1938), Nos. 7, pp. 129–156, figs. 2; 8, pp. 157–184, figs. 2*).—Included are reports of the usual types on crops and livestock, farm labor and wages, etc., and market reports for cotton, dairy and poultry products, feeds, seeds, grains, livestock, and livestock products.

Carlot shipments of fruits and vegetables from stations in the United States, calendar year 1936, compiled by L. Norgren (*U. S. Dept. Agr., Bur. Agr. Econ., 1938, pp. 73*).—Tables show for 43 fresh fruits, vegetables, melons, mixed citrus and deciduous fruits, and mixed vegetables, and dried apples, peaches, and prunes carlot shipments by freight and by express and boat reduced to carlot equivalents and grouped by States and countries.

Car-lot unloads of certain fruits and vegetables in 66 cities and imports in 4 cities for Canada, calendar year 1937 (*U. S. Dept. Agr., Bur. Agr. Econ., 1938, pp.* [2]+*73*).—Tables are included for each of 66 cities in the United States and 4 in Canada showing the carlot unloads of apples, cabbage, cantaloups, carrots, celery, grapefruit, grapes, lemons, lettuce, onions, oranges, peaches, pears, plums, potatoes, strawberries, sweetpotatoes, tangerines, tomatoes, and watermelons by State of origin, by months 1937, and by years 1935–37, inclusive.

International yearbook of agricultural statistics, 1937–38 (*Internatl. Inst. Agr.* [*Roma*], *Internatl. Yearbook Agr. Statis., 1937–38, pp. XXXV+1013*).—This volume continues the series previously noted (E. S. R., 78, p. 271).

Doubts about statistical supply analysis, J. M. Cassels and W. Malenbaum (*Jour. Farm Econ., 20* (*1938*). *No. 2, pp. 448–461, figs. 3*).—New analyses were made of the data used in studies of milk production responses made by Vermont dairy farmers by M. Ezekiel for the period 1919–25 and by Cassels for the period 1922–31, with a view to determining the causes for the wide variances in coefficients of determination obtained.

RURAL SOCIOLOGY

[Investigations in rural sociology by the North Carolina Station, 1936] (*North Carolina Sta. Rpt. 1936, pp. 74, 75*).—Included are some brief general findings by C. H. Hamilton in a survey made in cooperation with the T. V. A. of 592 open country households in the Cranberry-Hughes area, Avery County, to determine the relation of certain human and social factors to soil erosion and its control, and of recent changes in the social and economic status of 2,847 rural households in selected townships of 6 counties of the State; and in a study by M. T. Matthews, in cooperation with the F. E. R. A. and the W. P. A. of current changes since 1931 in the rural relief situation in 12 counties.

Co-operation as a culture pattern within a community, C. R. Hoffer. (Mich. Expt. Sta.). (*Rural Sociol., 3* (*1938*), *No. 2, pp. 153–158*).—This article shows how cooperation of individuals and groups appears as a culture pattern in the community of Howell, Mich., a well-established community in central Michigan with a predominantly native white population of 3,615 persons in the city and 4,745 (estimated) people in the surrounding trade area of approximately 188 sq. miles. Formal cooperative activities began in the 1890's with the formation of a County Holstein Friesian Association and was gradually extended to a Dairy Herd Improvement Association, a Farmers' Cooperative Association, and a County Veterinary Service. Informal activities included the establishment of a community hospital, a public library, the organization of charities, and the development of various town-county relationships.

The author states that "the pattern of cooperation was largely indigenous, since influences favorable to cooperation from outside its borders were not different than in other communities of its type where cooperation did not develop. Direction or regulation by the larger units of government or other central agencies did not interfere with the process. The fact that its development has occurred without special stimulation from outside agencies suggests that local communities may still maintain a considerable degree of autonomy in the formulation of their future patterns."

FOODS—HUMAN NUTRITION

Practical physiological chemistry, P. B. Hawk and O. Bergeim, in collab. with B. L. Oser and A. G. Cole (*Philadelphia: P. Blakiston's Son & Co.,* [*1937*], *11. ed., pp. XXII+968, pls. 7, figs. 281*).—With respect to the changes made in the eleventh edition of this well-known textbook (E. S. R., 69, p. 142), the authors note that "due to the profound advances made in certain phases of biochemistry, it was mandatory to rewrite several portions of the book. These include the chapters on vitamins and deficiency diseases, enzymes and their action, endocrine organs, protein metabolism, fat metabolism, carbohydrate metabolism, inorganic metabolism, salivary digestion, gastric digestion, pancreatic digestion, intestinal digestion, bile, putrefaction and detoxication, blood and tissue analysis, and the section on teeth." The general form is unaltered.

The analysis of Ceylon foodstuffs, I–V (*Trop. Agr.* [*Ceylon*], *90* (*1938*), *No. 1, pp. 3–29*).—Five papers are presented.

I. *General*, A. W. R. Joachim (pp. 3–6).—The nature and scope of the study are discussed and the results are summarized.

II. *Some important cereals, pulses, oilseeds, and roots*, A. W. R. Joachim and D. G. Pandittesekere (pp. 7–10).—Data are given for about 30 food products on the moisture, protein, fat, fiber, mineral matter, and carbohydrate contents and the caloric values. Calcium and phosphorus determinations were made on rice, kurakkan, and green gram. The cereals tested had higher carbohydrate and lower protein content than the pulses. The roots were high in carbohydrate and the oilseeds were high in fat. The rices were low in calcium and high in phosphorus, the kurakkan high in calcium and comparatively low in phosphorus, and the green gram tested rich in phosphorus and low in calcium.

III. *Some leafy and non-leafy vegetables*, S. Kandiah and D. E. V. Koch (pp. 11–16).—Similar determinations were made on 28 vegetables. The leafy vegetables tested were found to be richer in mineral matter, carbohydrate, and fiber content than the nonleafy vegetables, with very little difference noted in moisture content and caloric value. The protein and fat contents were low in all vegetables tested.

IV. *The vitamin C contents of some Ceylon fruits and vegetables*, A. W. R. Joachim and C. Charavanapavan (pp. 17–21).—The ascorbic acid content of trichloroacetic acid extracts of 31 fruits and 10 vegetables was determined by titration with 2,6-dichlorophenolindophenol, with glacial acetic acid used to prevent the rapid fading of the color during titration.

Of the fruits tested the guava was the richest source of vitamin C, with a content of 127 mg per 100 g, followed by the mango (*Ambalavi*) 80 mg, and the papaw 61 mg per 100 g. The citrus fruits varied in vitamin C content from 28 mg for seedless lime to 57 mg for oranges. Among the poorest fruit sources of vitamin C reported are the avocado pear, pomegranate, plantain, and coconut.

Of the vegetables tested, the leaves of the agathi (*Sesbania grandiflora*) were the richest source of vitamin C, with a content of 181 mg per 100 g, followed by the pods of the drumstick (*Moringa oleifera*) 80 mg, spinach 66, chilies (*Capsicum annuum*), large, 50.5 mg, and mukunuvenna (*Althernanthera triandra*) 33 mg per 100 g. Among the poorest sources of vitamin C reported are the ash plantain (*Musa paradisiaca*), betel leaf (*Piper betle*), and the tamarind (*Tamarindus indica*) dried.

V. *Palm saps* (*toddy*) *and jaggery*, A. W. R. Joachim and S. Kandiah (pp. 22–29).—Sixteen samples of palmyra (*Borassus flabellifer*), 11 of fermented and nonfermented kitul (*Caryota urens*) palm juices (toddy), and 4 of crude sugar (jaggery) made from the sweet toddy of the palmyra, kitul, and coconut palms were analyzed for total solids and the sap for cane sugar, reducing sugar, acetic acid, and alcohol. The palm juices were collected in new, smoked, and limed pots.

The results show that the sap is almost pure sucrose when it exudes from the tree, before inversion and fermentation take place. The limed pots tend to retain the sweetness of the toddy and smoked pots appreciably delay fermentation. The use of toddy as a source of yeast containing the vitamin B complex is recommended. With a sugar content of about 80 percent the jaggery from the palms is essentially an energy-supplying food.

A colorimetric method for the estimation of nicotinic acid in foodstuffs, M. Swaminathan (*Nature* [*London*], *141* (*1938*), *No. 3538, p. 830*).—In this preliminary note the author describes a method which is sensitive to amounts of 0.01 mg of nicotinic acid in foods and depends upon the production of a yellowish-green color by the pyridine ring in the presence of cyanogen-bromide and aniline. The method was applied to 12 foodstuffs, and the following are some of the values reported: Dried brewers' yeast 62.5 mg percent, skim milk powder 10.53, whole wheat 5 33, soybean 4.85, parboiled home-pounded rice 2.78, raw milled rice 2.38, and white corn 1.48 mg percent of nicotinic acid. The author suggests that the prevalence in India of the pellagra-like condition, stomatitis, may be attributed to the low content of nicotinic acid in the two staples of the diet, rice and corn.

A comparison between the 100 and 25 gram baking methods, R. H. Harris and T. Sanderson. (N. Dak. Expt. Sta.). (*Cereal Chem.*, *15* (*1938*), *No. 2, pp. 251–256*).—Using the standard A. A. C. C. 100-g method of baking and the similar procedure with 25 g of flour, 76 experimentally milled North Dakota hard red spring wheat flours were baked into loaves and compared as to volume.

While the 100-g method yielded the larger mean loaf volume, it also showed greater variability than did the 25-g method. By both methods a significant correlation was shown between loaf volume and wheat protein content. It is concluded that when sufficient materials are not available for the 100-g procedure, the 25-g method can be used to differentiate strong and weak varieties of wheat.

Oven spring of dough as correlated with certain properties of bread, W. O. Whitcomb. (Mont. Expt. Sta.). (*Cereal Chem.*, *15* (*1938*), *No. 2, pp. 206–216, fig. 1*).—Using the standard A. A. C. C. baking method, with 3 percent sugar substituted for 2.5 percent in the formula, the oven spring of doughs made from hard red spring and winter wheats of the 1933 and 1934 crops was determined. The loaves of bread were scored for crust color, boldness or symmetry, and texture. Other characteristics studied were loaf volume, protein content of the wheat, and absorption of the flour.

The oven spring of the dough averaged 1.14 and 1.23, respectively, for the 1933 and 1934 crops of spring wheat and 0.6 for the two crops of winter wheat combined. Close correlations were demonstrated between the oven spring of the dough and the loaf volume of the bread and the boldness of the loaf. A significant correlation was found between the oven spring of the dough and the texture of the bread. Insignificant correlations were demonstrated between the oven spring of the dough and the protein content of the wheat, the absorption of the flour, and the color of the crust of the bread.

Improving the nutritive value of bread by the addition of dry milk solids, B. W. Fairbanks. (Univ. Ill.). (*Cereal Chem.*, *15* (*1938*), *No. 2, pp. 169–180, figs. 3*).—The nutritive values of breads made by the straight dough method with water and with 6 and 12 percent milk solids were compared by feeding tests on groups of rats.

The rats receiving ad libitum the bread made with water as the sole diet had an average weight gain of 35.3 g over an 11-week period as compared to 110.1 g for the group on the bread containing 6 percent milk solids and 164 g for the group on the bread containing 12 percent milk solids. The total food consumption of the three groups averaged 500.2, 712.6, and 832.3 g, respectively.

Two further simple objective tests for judging cake quality, V. W. Swartz (*Cereal Chem., 15 (1938), No. 2, pp. 247–250*).—Two simple objective tests for evaluating cake quality are described. One is a sand retention test which measures the average relative size of the pores or grain of the cake and consists of covering a weighed 2-in. round sample taken from the inside of the cake with sifted sand and then placing the sample on a 40° incline and rotating it to dislodge all the sand not retained in the pores. The amount of sand retained is indicated by the difference in weight and is a measure of the coarseness of the grain. The application of this test to four samples of devil's food cake and to pairs of yellow, white, and devil's food cakes made with lard and with hydrogenated vegetable oil shortening gave fairly consistent results.

The other test measures the ability of a cake to absorb water. Weighed samples of the inner portion of the cake are placed in a dish containing a known amount of water at room temperature for 5 sec., removed, inverted quickly to prevent water loss, and weighed immediately. The water-absorbing ability or "wetability" of the cake is represented by the difference in weight. The application of this test to samples from the three types of cake noted above gave fairly constant results. The lard cakes had the greater water absorbing ability. In the tasting tests on the cakes the majority of the judges preferred the quality of the cakes with a better wetability. It is concluded that the ability of cakes to take up water rapidly is in some way correlated with a desirable eating quality.

Gelatinization and retrogradation changes in corn and wheat starches shown by photomicrographs, S. Woodruff and M. M. MacMasters (*Illinois Sta. Bul. 445 (1938), pp. 43, figs. 18*).—This publication discusses the preparation of corn and wheat starches for studying the effects of gelatinization and retrogradation by means of photomicrographs. The material, which is presented in six sections dealing with the starches used in the study, gelatinized starch, starch retrograded by freezing, starch retrograded by alcohol, microscopic particles appearing in gelatinized starch, and the measurements of physical properties, has been noted previously from journal publications (E. S. R., 75, p. 277) and from progress reports (E. S. R., 78, p. 274).

The sloughing of potatoes, M. A. Barmore. (Colo. Expt. Sta.). (*Amer. Potato Jour., 15 (1938), No. 6, pp. 170, 171*).—In a study of the culinary qualities of potatoes, which has been noted in progress (E. S. R., 79, p. 129), the author reports that the amount of sloughing during cooking is decreased if the tubers are stored under moderately warm conditions (about 65° F.). The tests were made on two varieties of potatoes pared and diced into 2-cm cubes, cooked in boiling water for 30 min., and screened through a ½-in. mesh screen. The potato which passed through the screen with the water was filtered out and dried on a weighed filter paper for 40 hr. at 100° C. The amount of sloughing is determined by dividing the weight of dry residue by the weight of diced tubers times 100.

Suitable paper wrappers and containers for foods, J. R. Sanborn. (N. Y. State Expt. Sta.). (*Amer. Jour. Pub. Health, 28 (1938), No. 5, pp. 571–575*).—Essentially noted from another source (E. S. R., 78, p. 885).

Food service in institutions, B. B. West and L. Wood (*New York: John Wiley & Sons; London: Chapman & Hall, 1938, pp. VIII+543, figs. 42*).—This textbook is divided into three sections dealing with quantity foods, including meal planning and food selection and preparation; the selection, operation, and care of equipment; and the organization and administration of food services. A classified list of books and references is given at the end of each chapter. The appendix contains a suggested course outline for quantity food preparation, and plans for a school lunch system, for cooperative meal services for residence and nonresidence students, and for organized college groups.

Basal metabolism and food intake of college women, H. McKay and M. B. Patton (*Ohio Sta. Bimo. Bul. 193* (*1938*), *pp. 146–149*).—Basal metabolism data are reported for 11 college women students, including 4 seniors, 5 sophomores, and 2 freshmen, all of whom were apparently in good physical condition, although 4 were decidedly underweight in relation to age and height according to the Wood standards. The subjects ranged in age from 18 to 23 yr., with 5 in the 19-yr. group. The Benedict-Roth respiration apparatus was used for the determinations, and two observations were made each test day. If these agreed within 5 percent, the average was taken as the basal figure for that day. The tests were repeated on a second and occasionally a third day, and the final values thus consisted of an average of at least four observations. Data on food consumption were obtained during 1 week in which each subject weighed all the food taken and at each meal collected and weighed a sample equivalent to one-tenth the amount of the various foods selected. These composite samples were used for protein determinations by the Kjeldahl method and calorie values by the oxycalorimeter.

The basal metabolism figures ranged from 1,031 to 1,468 in total calories and from 31 to 37 in calories per square meter per hour. The 2 subjects giving the lowest figures were decidedly underweight, but another subject who was 26 percent underweight had a basal metabolism within the accepted 10 percent deviation. The calorie values of the food intakes ranged from 1,119 to 2,568 total calories, and from 146 to 1,242 calories in excess of the corresponding basal metabolism figures. Three of the subjects had less than 1,500 and 2 more than 2,000 calories daily. The subject with the lowest calorie intake was slightly overweight and had evidently been dieting. The calorie intake of the subject who was the most underweight was only about 300 calories in excess of her basal requirement. The protein intakes ranged from 41 to 82, with an average of 61 g daily. For all but 2 of the subjects, whose intakes were between ⅔ and 1 g per kilogram of body weight, the protein intake exceeded the commonly accepted standard of 1 g per kilogram of body weight.

Protein adequacy for college students, V. R. Goddard and H. R. Morgan. (Univ. Calif.). (*Jour. Amer. Dietet. Assoc.*, *14* (*1938*), *No. 4*, *pp. 251–255*).—Preliminary studies at Los Angeles on 8 students consuming from 0.6 to 0.9 g of protein per kilogram of normal body weight and 3 control subjects consuming from approximately 68 to 102 g of protein per day revealed that the albumin: globulin ratio of the serum was within the normal range of from 1.5 to 2.8 for all subjects. The urinary nitrogen content of the 24-hr. samples ranged from 5.3 to 8.3 g for the low protein subjects and from 9.8 to 14.8 g for the control subjects. Basal metabolism tests made with a Collins metabolimeter of the Benedict-Roth type showed the average deviation from the Boothby and Sandiford modification of the DuBois normal standards for the low protein group to be —11.45 as compared to —1.53 for a control group comprising 13 subjects.

The results indicate that the detrimental effect, if any, of a food intake habitually low in protein cannot be detected by a study of the albumin: globulin ratio of the blood serum.

Animal products as sources of protein, calcium, and phosphorus in the human diet, M. M. Kramer and I. Gillum. (Kans. Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, *14* (*1938*), *No. 4*, *pp. 256–260*).—The protein, calcium, and phosphorus outputs of 23 college women were studied during three periods: (1) When the subjects were eating freely chosen diets, (2) with cheese and milk omitted, and (3) with high protein foods of animal origin omitted (7 subjects).

During period 1 the average daily protein intake was 64.8 g, calcium 1.09, and phosphorus 1.26 g as compared to 58.7 g, 0.58, and 0.94 g, respectively, during period 2, and 40.1 g, 0.45, and 0.77 g, respectively, during period 3. In the first period 3 subjects had calcium intakes below the Sherman standard allowance of 0.68 g and 14 had phosphorus intakes below the allowance of 1.32 g; in the second period 7 were below the calcium and 1 was below the phosphorus allowance; and in the third period no subject reached either allowance and 3 were below the Sherman requirement of 0.45 g of calcium and 6 were below the requirement of 0.88 g of phosphorus. The Sherman standard for protein, 70 g, was exceeded by only 6 subjects in period 1 and 3 in period 2, and the Sherman requirement for protein, 35 g, was attained by only 2 subjects in period 3. It is noted that in general the subjects having an adequate calcium or protein intake also received good amounts of phosphorus, the coefficient of correlation being 0.7618 for the calcium-phosphorus relationship and 0.8139 for the protein-phosphorus relationship in the first period and 0.8532 and 0.5356, respectively, in the second period when milk and cheese were omitted from the diet. The importance of milk as a source of calcium and phosphorus is demonstrated in this study.

A handbook of methods for the study of adolescent children, W. W. Greulich, H. G. Day, S. E. Lachman, J. B. Wolfe, and F. K. Shuttleworth (*Washington, D. C.: Soc. Res. Child Devlpmt., Natl. Res. Council, 1938, pp. XVII+406, figs. 30*).—This handbook of methods and technics used in the study of child growth and development is divided into five parts dealing with the anatomical, biochemical and physiological, medical and clinical, and psychological aspects, and the problems not involving direct measurements of children, such as measurable aspects of the environment, influence of heredity and environmental differences, and statistical considerations. The bibliography contains many references. The introduction is by L. K. Frank.

Food consumption of children at the National Child Research Center, H. N. Hann and H. K. Stiebeling (*U. S. Dept. Agr. Circ. 481 (1938), pp. 34*).—This report describes the type of meals served to a group of about 60 normal, healthy children between 24 and 71 mo. of age and contains data on the food intake both at the school and at home in terms of quantities of common foods and of essential nutrients and the school expenditures for different types of food. The data were obtained by 3- to 5-day observations made in the research center and in the homes during a 5-yr. period. The noon meal served at school consisted of egg, meat, or other protein-rich main dish, one vegetable in addition to potato or other starch food, whole wheat toast or sandwich, milk, and a custard, cornstarch, or bread pudding or fruit dessert, with a serving of tomato juice in the morning and milk and graham crackers in the afternoon.

The average total daily energy intake was 1,362 calories for 17 children from 24 to 35 mo. of age, 1,287 for 19 children from 36 to 47 mo. of age, and 1,451 calories for 21 children from 48 to 59 mo. of age. The average child derived 54 percent of the caloric intake from milk, 15.9 from vegetables, 6.8 from eggs, meat, and fish, 13 from cereal grains, 7.9 from fats, and 2.5 percent from sugars in the school diet; and 42.6 percent, 17.8, 7.4, 17.6, 8.4, and 6.2 percent, respectively, in the meals served at home. The food served at school furnished over 40 percent of the total daily energy requirement, with from 15 to 18 percent derived from protein, and after the addition of skim milk and an increase in the consumption of liquid milk from ⅔ to ¾ g each of calcium and phosphorus and after additional emphasis on the use of iron-rich foods, from 4 to 5 mg of iron, from 2,000 to 4,000 International Units of vitamin A, from 130 to 190 vitamin B_1, and from 350 to 650 I. U. of vitamin C, and from 350 to 500 Sherman units of vitamin G. During the first part of the study the average daily consumption of milk at school was 1.4 cups, which was later increased to 2.1 cups and at home amounted to 1.9 cups per child.

Approximately one-third of the expenditures for food at school were for milk, from one-fourth to one-third for vegetables and fruits, one-fifth for eggs, liver, muscle meat, and fish, and the remainder for bread, butter, sugar, and miscellaneous items. During the four school years, beginning with 1933–34, the average daily cost of the food served at school amounted to 10 ct., 11.7, 10.1, and 12.8 ct. per child, respectively. It is pointed out that the differences in cost represent changing food prices rather than changes in food buying practices and in food choices.

Hemoglobin differences in healthy white and Negro infants, B. MUNDAY, M. L. SHEPHERD, L. EMERSON, B. M. HAMIL, M. W. POOLE, I. G. MACY, and T. E. RAIFORD (*Amer. Jour. Diseases Children, 55 (1938), No. 4, pp. 776–783, figs. 2*).—In a preliminary study hemoglobin measurements were made on 335 white and 140 Negro infants, using the Haden-Hausser hemoglobinometer and checking the results against those obtained by the Van Slyke gasometric method. Records were kept of anthropometric measurements, roentgenograms, blood counts, and the occurrence of illnesses.

For 574 determinations made on white infants aged from 1 to 3 mo. the average hemoglobin value was 11.49 g per 100 cc, and for 1,989 determinations on white infants aged from 4 to 14 mo. 11.45. This compared with 11.66 for 195 determinations on Negro infants aged from 1 to 3 mo. and 10.83 g per 100 cc for 711 determinations on Negro infants aged from 4 to 14 mo. The difference in hemoglobin averages for the two groups of younger infants is statistically insignificant, but for the two older groups the difference is distinctly significant. The older group of Negro infants showed the greatest variation in hemoglobin concentration.

In a 9-mo. study on an additional group, no significant difference was found between the red blood cell count in 63 white and 54 Negro infants.

Nutritional heart disease in children, J. I. WARING (*Amer. Jour. Diseases Children, 55 (1938), No. 4, pp. 750–760, figs. 5*).—Case histories are reported for 1 white child and 12 Negro children aged from 14 to 48 mo. with so-called nutritional heart disease. The replacement of an inadequate diet with an adequate one containing vitamin B_1 from brewers' yeast, wheat germ sugar, and rice polishings extract and high in protein brought about an apparent general improvement in all the patients, with a decrease in the size of the heart in some cases. In 3 of 8 cases in which the protein content of the blood was measured the albumin: globulin ratio had been disturbed. Data were also collected on 34 additional children with nutritional edema without evident cardiac disease. The findings suggest that some of the patients had a deficiency of protein, some a vitamin B_1 deficiency, and others a deficiency of a number of dietary essentials.

Food allergy in ulcerative colitis, T. T. MACKIE (*Jour. Amer. Dietet. Assoc., 14 (1938), No. 3, pp. 177–182*).—Dietary investigations were made in 65 cases of chronic ulcerative colitis and definite clinical evidence of active food allergy was obtained in 33 of the cases and less definite evidence in 15. The most commonly involved foods are reported to be milk 26 cases, wheat 11, egg 8, spinach 5, and orange 5 cases. It is concluded that "manipulation of the diet constitutes the single most important factor in the medical management of ulcerative colitis."

Potassium in the diet, V. ASHKINS and R. L. ZWEMER (*Jour. Amer. Dietet. Assoc., 14 (1938), No. 3, pp. 183–187*).—Data are presented on the potassium content of approximately 150 foods arranged in six groups containing from 0 to

7.3 g, and sample menus are given containing approximately 1, 2, 4, and 6 g of potassium.

Health in relation to prosperity in the South, D. Dickins (*Jour. Home Econ., 30 (1938), No. 6, pp. 370–375*).—The author discusses the present low standards of health among the people of the southern region and the ways of improving the situation by eliminating the diseases peculiar to the South, improving the diet, increasing the income, and educating the people about health.

Vitamin A and carotinoids in blood: Deficiencies in children suffering from xerophthalmia, J. H. de Haas and O. Meulemans (*Lancet [London], 1938, I, No. 20, pp. 1110, 1111*).—The vitamin A and carotene contents were determined spectrophotometrically in the blood serum of 11 infants between 7 weeks and 9 mo. of age and of 16 children, 15 of whom were between 1 and 4 yr. and 1 was 7 yr. All the subjects had xerophthalmia, and 5 were totally blind, 2 half blind, and the others exhibited xerosis of the conjunctiva and cornea and Bitot's spots.

Vitamin A was absent from the blood of 6 infants and present in amounts varying from 4 to 31 international units per 100 cc of serum in the remaining 5. The carotene content ranged from 12γ to 56γ per 100 cc of serum. Vitamin A was absent from the blood of 13 children and present in amounts varying from 2 to 38 international units per 100 cc in the remaining 3 children. The carotene content varied between 8 and 29 μg per 100 cc of serum.

All the subjects in whom the corneas were not yet perforated were cured following the administration subcutaneously of 0.5 cc of Davitamon A (Organon) containing 40,000 international units of vitamin A per cubic centimeter as supplement to an adequate diet with cod-liver oil. It is concluded that "the absence of vitamin A in the serum of children is essential but not necessarily pathognomonic for xerophthalmia."

The efficacy of parenteral vitamin A administration in vitamn A deficiency: A clinical study of nine cases, F. T. Chu and C. K. Lin (*Chin. Med. Jour., 53 (1938), No. 5, pp. 413–426, figs. 6*).—The case histories of three infants and six adolescents with varying degrees of xerophthalmia who responded to treatment with vitamin A injected intramuscularly are presented. The vitamin A concentrate administered contained 30,000 International Units per gram and was given in divided doses of from 1 to 2 cc. The vitamin A content of the diet was restricted to the amount taken before the development of the ocular symptoms.

The eye condition improved during the first 2 days of treatment, and where other infections did not exist the xerosis disappeared. In one case the administration of one 2-cc dose of the concentrate protected the subject from a recurrence of xerophthalmia for a period of about 2 mo.

Simplification of vitamin tests.—Half-weekly instead of daily doses in vitamin B_1 tests on rats, H. Lindholm, P. Laursen, and B. G. E. Morgan (*Biochem. Jour., 32 (1938), No. 2, pp. 308–313, figs. 3*).—The authors compared the effects of feeding daily and half-weekly doses of dried yeast to rats maintained on a vitamin B complex-deficient diet and found no significant differences in the responses of the groups. Similar results were obtained with two groups of rats maintained on the same diet, with autoclaved dried brewers' yeast added, when daily supplements of 0.005 g and half-weekly supplements of 0.015 and 0.02 g of an absorption product of vitamin B_1 containing 200 international units per gram were given. The food records kept for one group showed that no sudden increase in weight or in food intake followed the administration of the half-weekly vitamin B_1 dose. No significant difference was noted when 5γ of crystalline vitamin B_1 was administered in place of the adsorbate daily and in half-weekly doses. It is concluded that half-weekly doses of the standard or the test substance may be substituted for daily doses in vitamin B_1 assays.

Peripheral neuritis associated with pyloric stenosis and deficiency of vitamin B_1, L. P. E. LAURENT and H. M. SINCLAIR (*Lancet* [*London*], *1938, I, No. 19, pp. 1045–1047*).—An adult with carcinoma of the stomach which caused pyloric stenosis and was accompanied by peripheral neuritis was cured of the neuritis by vitamin B_1 therapy. One mg of vitamin B_1 in the form of 1 cc Benerva (Roche), was given intramuscularly every other day until the patient was ambulatory and then 1 teaspoonful of Bemax was given daily. About 8 mo. after the treatment was started the vitamin B_1 content of the blood was estimated to be 4 μg per 100 cc, and after a 12-mo. period when 2 dr. of marmite had been added to the daily diet the vitamin B_1 content of the blood had increased to 10 μg per 100 cc. The vitamin B_1 content of the blood was determined by a modification of Schopfer's test which involves growing a fungus *Phycomyces blakesleeanus* upon a medium to which the blood is added. By this method a value below 7 μg per 100 cc is regarded as being abnormal.

Studies on the vitamin B complex, I, II, G. LUNDE and H. KRINGSTAD (*Biochem. Jour.*, *32* (*1938*), *No. 4, pp. 708–718*).—Two papers are presented.

I. *The occurrence of the rat anti-dermatitis factor (vitamin B_6) in fish and fish products* (pp. 708–711).—Bio-assays were made on rats receiving a diet consisting of purified casein 18 percent, rice starch 68, butterfat 8, Osborne and Mendel salt mixture 4, and cod-liver oil 2 percent, supplemented by 6γ vitamin B_1 and 10γ synthetic lactoflavine or 2 cc raw egg white as a source of lactoflavine. After 6½ weeks all of the animals had developed dermatitis. Test substances were given in amounts of from 0.25 to 2 g per day, and the time required for healing and the growth rates were recorded over a 6-week period. Peters' eluate, 0.2 cc of which is sufficient to cure dermatitis in rats, was used as the standard of reference.

The richest source of vitamin B_6 was raw cod liver, 0.25 g a day being sufficient to cure severe dermatitis and promote an average weight gain of 28 g in 6 weeks as compared to 29 g for 0.2 cc of Peters' eluate. Good sources of vitamin B_6 were raw flounder flesh and canned cod roe, herring and brisling sardines, and kippered herring. The canned crab and raw cod flesh supplements cured the dermatitis but did not promote growth, while canned herring milt promoted growth but failed to cure dermatitis. It is suggested that in addition to vitamin B_1 and lactoflavine rats require at least two factors for normal development, an antidermatitis factor and a growth factor.

II. *Experiments on the effect of isoleucine on the "pellagra-like" dermatitis in rats* (pp. 712, 713).—The administration of from 50 to 70 mg *d*-isoleucine or 100 mg *dl*-isoleucine failed to cure the dermatitis in rats maintained on the dermatitis-producing diet within from 3 to 5 weeks. The administration of 150 mg of rice polish concentrate to two rats previously receiving *d*-isoleucine resulted in a complete cure of the dermatitis within 3 weeks, accompanied by rapid increases in weight.

The response of rats to graded doses of flavin, H. LINDHOLM (*Biochem. Jour.*, *32* (*1938*), *No. 2, pp. 314–320, figs. 2*).—A basal diet consisting of casein 15 percent, dextrinized rice starch 77, agar agar 2, Steenbock's No. 40 salt mixture 4, and vitamin B_1 powder 2 percent, or approximately 12 international units per day, and 6 drops of cod-liver oil twice weekly was tested on four groups of rats (1) unsupplemented, (2) with 10γ flavine, (3) with 1 cc liver extract, and (4) with 10γ flavine+1 cc liver extract daily. The rats receiving both flavine and liver extract grew rapidly, but the administration of one supplement alone failed to promote growth. Six groups of 7 or 8 rats were given the diet with 1 cc of liver extract added, and when growth had ceased five of the groups received 1γ, 2.5γ, 5γ, 10γ, and 20γ flavine for a 3-week period. The average weight increases of the male and female rats were calculated and plotted against the logarithms of the doses of flavine given.

The following equations representing the curves of response of the male and female rats, respectively, were obtained: $y = 2.95 + 24.04 \log x$ and $y = 5.53 + 15.85 \log x$. The authors report that the method possesses a high degree of accuracy. The probable error of determinations made with two groups of 10 male rats each was +24.2 percent when the standard was used and —19.5 percent for the test substance. With female rats the probable error was +26.5 or —20.9 percent. The standard deviations of the responses were 7.65 for the male and 5.44 for the female rats.

The application of the method to the determination of the flavine content of fresh unpasteurized milk gave curves of response having about the same slope as the test curves. The average value of the milk was calculated to be 7.8γ of flavine per cubic centimeter. It is noted that the rats receiving less than 10γ of flavine developed dermatitis similar to the condition described by Halliday and Evans (E. S. R., 78, p. 284). The addition of milk cured or prevented the dermatitis.

Vitamin C content of home-canned tomato juice, H. M. Hauck. (Cornell Univ.). (*Jour. Home Econ., 30 (1938), No. 3, pp. 183–188*).—The amount of reduced ascorbic acid retained in home-canned tomato juice and tomatoes from the same lot canned in unlined tin cans and in glass containers and stored for from 8 to 9 mo. was determined by the Bessey and King modification (E. S. R., 71, p. 137) of the Tillmans method, with hot 8 percent acetic acid used in the extraction. A few estimates were made of the total ascorbic acid content after treatment of the extracted juice with hydrogen sulfide for from 15 to 20 min. The glass jars were stored in sealed cardboard cartons with a few left exposed to the light in a glass-doored cupboard. The tests were made on the samples when freshly opened and after holding for 1, 2, 3, and 4 days in the refrigerator. Upon opening the tin cans the juice was transferred to glass jars and left covered for the 4-day period.

Tomato juice canned in tin had an average reduced ascorbic acid content of 0.207 mg when freshly opened and 0.152 mg per cubic centimeter after 4 days. For the tomato juice canned in glass and stored in the dark the comparable values were 0.098 and 0.037 mg per cubic centimeter, respectively. The juice of tomatoes canned in tin contained 0.178 mg when freshly opened and 0.165 mg per cubic centimeter after 4 days. For the juice of tomatoes canned in glass the comparable values were 0.087 and 0.067 mg per cubic centimeter, respectively. The percentage of reduced ascorbic acid retained in the tomato juice canned in tin and held for 1 day after opening averaged 97, 2 days 92, 3 days 85, and 4 days 73. In the juice of tomatoes canned in tin the comparable percentages obtained were 96, 95, 94, and 93, respectively. The tomato juice canned in glass and held for 1 day retained 91 percent of the reduced ascorbic acid content, 2 days 67, 3 days 48, and 4 days 38 percent. In the juice of tomatoes canned in glass the comparable percentages were 87, 81, 80, and 76, respectively. The percentage of total ascorbic acid found in the reduced form averaged 96 for the tomato juice and 98 for the juice of tomatoes canned in tin and 89 and 86, respectively, for the samples canned in glass when freshly opened as compared to 87 and 97, and 43 and 74, respectively, after 4 days in the refrigerator. It would appear that the ascorbic acid content of tomato juice and of canned tomatoes is more stable when tin cans rather than glass jars are used in the canning process.

In two samples of the same tomato juice canned in glass, one exposed to the light and the other stored in the dark for from 8 to 9 mo., the reduced ascorbic acid contents were 0.158 and 0.088 mg per cubic centimeter when freshly opened and 0.117 and 0.035 mg, respectively, when held for 4 days after opening. The results suggest that the presence of light may aid in the preservation of vitamin C.

Losses of vitamin C during the cooking of Swiss chard, F. Fenton, D. K. Tressler, S. C. Camp, and C. G. King. (N. Y. State Expt. Sta. et al.). (*Jour. Nutr., 14 (1937), No. 6, pp. 631–640, figs. 2*).—Determinations were made on the vitamin C content of raw Swiss chard, of cooked chard, and of the cooking water at the done and overdone stages and at various intermediate stages. The method of sampling described in a previous study (E. S. R., 77, p. 280) was followed, and the Mack and Tressler modification (E. S. R., 78, p. 154) of the titration method for determining vitamin C was used. Biological assays were made of the raw and done chard which had been stored in dry ice.

The average vitamin C content of the Lucullus variety of freshly cut raw chard leaves containing the midrib was 0.4 mg per gram (wet weight) and 3.74 mg (dry weight) and of the Fordhook variety, which contained a larger proportion of midrib, 0.37 and 3.6 mg per gram, respectively. At the done stage after 10 minutes' cooking in boiling water the average destruction of vitamin C in the Lucullus variety was 6 percent, with 41 percent retained in the chard and 53 percent in the cooking water and of the Fordhook variety 16 percent, with 40 percent retained in the chard and 44 percent in the cooking water. The destruction of vitamin C at the overdone stage, 14 minutes' cooking, amounted to 9 and 19 percent, respectively, for the two varieties, with 29 and 25 percent, respectively, retained in the chard and 62 and 56 percent, respectively, in the cooking water.

Vitamin D complex in keratoconus: Etiology, pathology, and treatment of conical cornea.—Preliminary report, A. A. Knapp (*Jour. Amer. Med. Assoc., 110 (1938), No. 24, pp. 1993, 1994*).—The administration of from 60 to 200 drops of viosterol supplying 10,000 International Units of vitamin D per gram and 1 or more mineral mixture tablets containing 140 mg of calcium, 83 phosphorus, 1 iron, 0.05 copper, 2.8 magnesium, 5 sodium, and 5 mg potassium to 11 patients with keratoconus in one or both eyes resulted in improved vision in all cases and a reduction in the hyperbolic bulging of the cornea in 5 out of 6 eyes subjected to a detailed examination.

Other factors: Less well known vitamins, C. M. McKay (*Jour. Amer. Med. Assoc., 110 (1938), No. 18, pp. 1441–1446*).—The known essential factors in the nutrition of insects, bacteria, invertebrates, and the lower vertebrates are discussed, together with the miscellaneous growth factors and less well-known vitamins believed to be essential for human nutrition. Among the factors noted are "factor H," defined by the author as essential for the trout fish; the substance "H" (L. E. Booher), which is essential for rat growth; "vitamin H" (P. György), the rat antidermatitis factor; "Y factor" (H. Chick and A. M. Copping), required for growth in rats; filtrate factor (S. Lepkovsky and T. H. Jukes), which seems potent in curing dermatitis in chicks, blacktongue in dogs, and pellagra in man; vitamin I or B_7 (E. Centanni), which prevents digestive disturbances in pigeons; factor J (H. von Euler), which seems to cure pneumonia in guinea pigs; vitamin K (H. Dam), the antihemorrhagic factor in chickens; the gizzard-erosion factor (H. Dam); "vitamin P" (S. Rusznyak and

A. Szent-Györgyi), concerned with proper tonus in the capillary walls; and nicotinic acid, shown by C. A. Elvehjem to cure blacktongue in dogs and by other workers to be effective in the treatment of human pellagra. The toxic substances present in such foods as egg white, fish-liver oils, linseed and cottonseed meals, and cereals which appear to be neutralized by vitamins or vitamin-like substances are reviewed The bibliography contains 85 references.

Biochemistry and pathology of avitaminosis.—II, Histopathology and deficiency diseases, H. S. Thatcher, B. Sure, and J. Lee (*Arkansas Sta. Bul. 356 (1938), pp. 48, figs. 8*).—This bulletin, continuing the series noted previously (E. S. R., 69, p. 758), summarizes the results of completed and previously reported studies in the general field of histopathology of deficiency diseases, including several studies on vitamin B (E. S. R., 65, p. 494; 71, p. 282; 77, p. 137), vitamin G (E. S. R., 65, p. 494), and vitamin A (E S. R., 68, p. 278). The publication includes a general summary, a list of 26 literature references (not including most of the original reports of which the present publication is a digest), and a glossary of terms.

Present knowledge of pellagra: Clinical studies, D. T. Smith (*Jour. Amer. Dietet. Assoc., 14 (1938), No. 3, pp. 168–171*).—The author reviews the clinical investigations on pellagra patients and the laboratory findings on dogs. From these observations it is concluded that pellagra is basically a dietary deficiency and that the acute constitutional symptoms are due generally to an unknown toxic substance produced in the skin by the action of direct sunlight. The parenteral administration of liver extracts used in the treatment of pernicious anemia improves the condition of the mouth and tongue of the pellagra patients but does not affect the appetite or the other symptoms, whereas Valentine's liver extract given orally is an effective therapeutic.

Animal deficiency diseases related to pellagra, W. J. Dann (*Jour. Amer. Dietet. Assoc., 14 (1938), No. 3, pp. 157–167*).—The author reviews the history of the animal deficiency diseases related to human pellagra and presents a chronological table showing the development of our knowledge of the complexity of vitamin B_2 and the distinction between the supposed analogues of pellagra. The known factors of the vitamin B_2 complex which have been isolated and identified are listed as flavine, which is essential for rat and chick growth, prevents dermatitis in turkey poults, cataract in rats, and probably "yellow liver" in dogs, and is a constituent of oxidative enzymes; and nicotinic acid, which cures pellagra in man and blacktongue in dogs. Those which have been distinguished but not isolated or identified are the rat pellagra-preventive factor (p–p), which prevents rat pellagra, and the chick pellagra-preventive factor, which prevents chick pellagra and is essential for rat growth. The bibliography lists 43 references.

Blood copper and iron in Addison's disease, A. Sachs, V. E. Levine, and W. O. Griffith (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 3, pp. 486, 487*).—Copper and iron analyses of the blood of three patients with Addison's disease revealed a condition of hypoerythrocythemia and hypoferronemia in the two female and one male patients and was accompanied by hypercupremia in the females. No correlation was demonstrated between the copper content of the blood, which was 0.141 mg per 100 cc in the male and 0.224 and 0.193 mg, respectively, in the females, and the amount of skin pigmentation. The hemoglobin values calculated from the blood iron were 10.47, 10.42, and 10.64 g; iron content 35.08, 34.92, and 35.64 mg per 100 cc; and red cell counts 4,370,000, 3,880,000, and 3,888,000 per cubic millimeter, respectively.

The therapeutic application of acidophilus milk in constipation of children, L. F. Rettger, L. Weinstein, M. Bogin, and J. E. Weiss (*Amer. Jour. Digest. Diseases, 5 (1938), No. 3, pp. 170–173*).—Twenty-seven children with constipation who failed to respond to dietary correction were given 1 pt. of acidophilus milk in place of an equal quantity of sweet milk daily during a 12-week period. In 6 cases the treatment was repeated during a second 12 week period following a 4-week period without acidophilus milk. Stool examinations for *L[actobacillus] acidophilus* were made weekly.

Twenty-two of the group were completely relieved of intestinal stasis, with no recurrence of the constipation for a period of at least from 4 to 6 mo. after the acidophilus milk had been removed from the diet. Fourteen of the children carried the *L. acidophilus* organism in large numbers in the intestine for at least 16 to 20 weeks after cessation of treatment. In 2 cases the response was doubtful, and in 3 the constipation was not relieved.

HOME MANAGEMENT AND EQUIPMENT

Selection, installation, finish, and maintenance of wood floors for dwellings, R. K. Helphenstine, Jr. (*U. S. Dept. Agr. Circ. 489 (1938), pp. 27, figs. 6*).—Following a review of the history of the use of wood for flooring in the United States, the author, with the assistance of F. L. Browne, discusses the laying of the subfloor and of the finish floor, the selection of hard and soft wood flooring, and the methods of finishing, refinishing, and maintaining wood floors.

MISCELLANEOUS

Seventeenth Annual Report [of the Georgia Coastal Plain Station], 1937, S. H. Starr (*Georgia Coastal Plain Sta. Bul. 28 [1937], pp. 129, figs. 13*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-five years of service to Idaho agriculture: The Annual Report of the [Idaho] Agricultural Experiment Station for the year ending December 31, 1937, C. W. Hungerford et al. (*Idaho Sta. Bul. 225 (1938), pp. 84, figs. 20*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Fifty years in the service of agriculture, 1888–1938, by the Missouri Agricultural Experiment Station, University of Missouri (*Missouri Sta. Bul. 397 (1938), pp. 99, figs. 28*).—In addition to the addresses commemorative of the fiftieth anniversary, as presented June 21, 1938, the outstanding lines of research and some of the notable achievements are briefly reviewed.

[Fifty-ninth and Sixtieth Annual Reports of the North Carolina Station, 1936 and 1937], R. Y. Winters et al. (*North Carolina Sta. Rpts. 1936, pp. 80, figs. 5; 1937, pp. 86*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Guide to the agricultural experiment station (*Pennsylvania Sta. Bul. 360 (1938), pp. [2]+44, figs. 22*).—This includes general information on the research program of departments and their physical facilities and some data as to results which for the most part are noted elsewhere in this issue.

NOTES

Delaware University and Station.—Dean and Director C. A. McCue has been given leave of absence until July 1, 1939. George L. Schuster has been appointed acting dean and director.

Illinois Station.—Extensive experiments in pasture and livestock farming are now going forward in southern Illinois under the direction of the station, following the recent dedication of the Dixon Springs land utilization project in Pope County. This project has been in the hands of the land utilization division of the U. S. D. A. Bureau of Agricultural Economics, but has now been officially transferred to the Forest Service. That agency, in turn, will issue long-time use permits to the station and to the Soil Conservation Service, which is cooperating in some of the work in the area. Containing 10,000 acres, the project is to be developed as a testing ground and demonstration area to halt the further wasting away of an estimated 15,000,000 acres in the Central States. Some 5,000 or 6,000 acres of the area are being turned over to the station for research and demonstration work in pasture and livestock farming.

Recent appointments include R. W. Lorenz and Marjorie Pickens as associates in forestry and home economics, respectively, and H. W. Bean and Irene Crouch as assistants in animal husbandry and home accounts.

Kansas College and Station.—Hugh Durham, associated with the institution since 1914 and assistant dean from 1915 to 1937, died October 15 at the age of 63 years. A native of Kansas, he was graduated from the University of Kansas in 1909 and received the M. S. degree there in 1915. In addition to his work as assistant dean, he also served many years as associate professor of agricultural education.

Maryland University and Station.—The death on September 26 is noted of Dr. Theodore B. Manny, head of the department of sociology since 1935. A native of Illinois, Dr. Manny was graduated from the University of Illinois in 1918 and received the M. S. and Ph. D. degrees from the University of Wisconsin in 1923 and 1928. He was research assistant in rural sociology in the latter university from 1921 to 1923, professor of rural life in Hendrix College from 1923 to 1927, and for the next 8 years a senior agricultural economist in charge of studies of rural social organization in the U. S. D. A. Bureau of Agricultural Economics. He was the author of Rural Municipalities. 1930.

Howard L. Bodily has been appointed instructor in soil microbiology.

Michigan Station.—Drs. W. O. Hedrick and Eben Mumford, research associates in economics and sociology, respectively, retired as of September 1. Appointments as research assistants include Dr. H. E. Larzelere in economics vice Dr. R. J. Burroughs, who has accepted a position with the Federal Housing Administration; Drs. D. L. Gibson and Paul Honigsheim in sociology, the former vice Dr. H. A. Gibbard, who goes to Brown University; F. M. Atchley in farm management vice H. B. Taylor; Dr. Thelma Porter, associate food economist in the U. S. Department of Agriculture, in home economics vice Kathleen S. Dietrich, now at the Connecticut College; and Drs. H. G. Petering and P. W. Morgal in chemistry for studies relating to the industrial uses of agricultural products which are being financed by Rackham Foundation funds.

New York State Station.—Glen P. Van Eseltine, botanist and associate in research since 1927, died November 14 at the age of 50 years. A native of

Syracuse, N. Y., he was graduated from Syracuse University in 1913. He served as aid in the U. S. National Herbarium in Washington from 1913 to 1915 and from then until 1922 as assistant botanist in the U. S. Department of Agriculture. His professional work was in taxonomic botany, especially that dealing with economic and horticultural plants. He was the author of numerous Government and station publications on botanical subjects, contributor to scientific journals, and the coauthor of Beans of New York, Sweet Corn of New York, and Cucurbits of New York.

Pennsylvania College.—The new poultry plant was dedicated October 27. This plant consists of an experimental unit 550 ft. in length and 27 ft. wide, an instruction unit 240 by 27 ft., and a central service building with several laboratories, feed storage, and refrigeration facilities.

South Dakota College and Station.—Vice Director I. B. Johnson has been appointed director of the station vice James W. Wilson, who has been retired from administrative duties carried on since 1902 and made director emeritus. R. W. McMartin, assistant in farm management, has resigned to engage in graduate work and has been succeeded by Max Myers. Dr. R. L. Woolbert has succeeded Dr. J. P. Johansen, resigned as assistant professor and assistant in rural sociology to take charge of the department of social sciences in the North Dakota College. Other appointments include S. A. McCrory, who succeeds C. E. Hoxsie, assistant professor and assistant in horticulture and forestry, resigned to become professor of horticulture at the Rhode Island College, and N. P. Larson as assistant professor of entomology and zoology and assistant entomologist.

Association of Land-Grant Colleges and Universities.—In addition to the general officers enumerated on page 4, the following section officers were elected at the Chicago meeting, November 14–16, 1938: Agriculture, H. H. Kildee of Iowa, chairman, S. W. Fletcher of Pennsylvania, vice chairman, and T. R. Bryant of Kentucky, secretary; engineering, R. L. Spencer of Delaware, chairman, and G. W. Case of New Hampshire, secretary; home economics, Lita Bane of Illinois, chairman, and Pearl S. Greene of Maine, secretary; and for the newly organized section of graduate work, E. M. Freeman of Minnesota, chairman, and W. C. Russell of New Jersey, secretary. Within the section of agriculture, the subsection of experiment station work elected C. McKee of Montana, chairman, and C. R. Orton of West Virginia, secretary; the subsection of extension work, J. W. Bateman of Louisiana, chairman, and William Peterson of Utah, secretary; and the subsection of resident teaching, J. F. Cunningham of Ohio, chairman, and H. F. Cotterman of Maryland, secretary.

A considerable number of changes took place in the membership of committees. On the committee on college organization and policy, E. G. Peterson of Utah (chairman) and C. A. Dykstra of Wisconsin succeeded J. A. Burruss of Virginia and C. S. Boucher of West Virginia for 3 years and H. C. Byrd of Maryland took the place of W. E. Clark of Nevada for 2 years. On instruction in agriculture, A. A. Hauck of Maine (chairman) and W. C. Coffey of Minnesota were appointed vice E. H. Shinn of the U. S. Department of Agriculture and I. L. Baldwin of Wisconsin; on instruction in engineering L. R. Van Leer of North Carolina and R. L. Wales of Rhode Island vice G. W. Case of New Hampshire and F. C. Bolton of Texas; on instruction in home economics, S. Frances Smith of Montana and Margaret M. Justin of Kansas vice Ava B. Milam of Oregon and Mildred F. Horton of Texas; on experiment station organization and policy, M. F. Miller of Missouri, A. B. Conner of Texas, E. C. Johnson of Washington, and Statie E. Erikson of Kentucky vice C. B. Hutchinson of California, M. J. Funchess of Alabama, H. W. Mumford of Illinois, and Margaret M. Justin of Kansas, with R. E. Buchanan of Iowa becoming chairman; on extension organization and policy, L. R. Simons of New York, H. J. C. Umberger of Kansas, and Ellen LeNoir of Louisiana vice C. A. McCue of Delaware, W. H. Brokaw of Nebraska, and Lurline Collier of Georgia, with H. H. Williamson of Texas becoming chairman; on military organization and policy, L. N. Duncan of Alabama and G. D. Humphrey of Mississippi vice James M. Smith of Louisiana and G. W. Rightmire of Ohio; on engineering experiment stations, C. E. MacQuigg of Ohio vice T. R. Agg of Iowa; on radio, W. A. Schoenfeld of Oregon vice F. M. Hunter of Oregon; on land-grant institutions for negroes, P. W. Chapman of Georgia (chairman) vice H. F. Cotterman of Maryland; on relationships, C. E. Friley of Iowa vice H. W. Mumford of Illinois; and on rural youth, Martha H. Eddy of New York and D. W. Watkins of South Carolina, the former vice L. R. Simons of New York, with H. C. Ramsower of Ohio as chairman. No changes were made in the committees on graduate work, potash resources, phosphate deposits, training for Government service, the problem of accrediting, the Federal-aid bill for education, the influence of 4-H club work, and the joint committee on publication of research. S. B. Doten of Nevada replaced W. C. Coffey of Minnesota on the joint committee on projects and correlation of research.

Association of Official Agricultural Chemists.—The fifty-fourth annual meeting of this association was held in Washington, D. C., November 14–16, 1938, with the exceptionally large registration of 553. The address of the president, H. R. Kraybill, was concerned with the role of chemistry in the utilization of farm products and farm wastes. Dr. Kraybill contrasted the "Food Will Win the War" slogan of 20 years ago with the problem of economically effective utilization of the present time. He pointed out that better agricultural methods, cheaper nitrogen, increased use of machines with reduction in consumption of farm products as feeds, and loss of foreign markets have all been factors in the creation of the surpluses with which we now have to deal, and that increased attention should be given to the utilization of residues and surpluses, in the development of crops of special industrial applicability, and in the replacement of imported plant products adapted for like industrial uses. The eighth annual Wiley Memorial Address was given by L. M. Tolman under the title The History and Development of Food Inspection in the United States. Dr. Tolman, who became associated with Dr. Wiley in 1900, covered efforts to secure legal definition and control of the composition of food products from a considerably earlier period to the passage of the Food and Drugs Act of 1906, with some reference to subsequent developments.

The officers elected were W. S. Frisbie as president and L. B. Broughton as vice-president. W. W. Skinner continues as secretary-treasurer, and the executive committee consists of J. W. Sale, G. G. Frary, H. R. Kraybill, and J. O. Clarke.

Association of American Feed Control Officials, Inc.—This association held its thirtieth annual convention in Washington, D. C., on November 17 and 18, 1938. The total registration reached a new maximum of 151, drawn from 23 States, Canada, and the District of Columbia. The address of the president, G. H. Marsh, largely on routine matters, was followed by the usual program, including technical papers on Recent Advances in Poultry Nutrition, by L. C. Norris, and Curative Method for the Assay of Vitamin D With Chicks, by V. Heiman. A considerable number of new definitions were formulated and adopted. The vice president of the association, L. M. Jeffers, was elected president, with J. F. King becoming vice president and P. B. Curtis a member of the executive committee. L. E. Bopst, College Park, Md., was continued as secretary-treasurer.

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EXPERIMENT STATION RECORD

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RESEARCH AT THE 1938 CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

Scrutiny of the program presented at the Chicago convention (E. S. R., 80, p. 1) soon reveals that while there were inevitably many incidental references to research in the general sessions and elsewhere, extended discussions were largely confined to the subsection of experiment station work. Within this subsection also the range of topics was more restricted than usual. Organization and policy problems formed the subject of the first of its two sessions, and under this head were considered only the relationship between experiment station and general university research and the equitable division of time between experiment station and college work of staff members doing both research and teaching. The second and concluding session dealt entirely with research as to new uses and outlets for agricultural crops and products. No report was made by the committee on experiment station organization and policy, that of the joint committee on publication of research considered no new questions, and that on projects and correlation dealt almost exclusively with the provision of additional service to investigators through critical reviews, monographs, and similar material.

As Associate Director Noble Clark of Wisconsin pointed out in opening the discussion of the relationship between experiment station and other university research, in the early days the experiment stations largely confined themselves to the application of the basic sciences to agriculture, but increasingly since the passage of the Adams Act they have become producers rather than jobbers and have long since ceased to be merely "trouble shooters" for farmers. In his judgment, they have as much justification, as adequate facilities, and as direct responsibilities for fundamental research in their fields as any other agency, and their development in this way is readily defended as a most productive investment.

Directors C. B. Hutchison of California and W. L. Slate of Connecticut likewise argued for the development of fundamental research in the stations, and the former pleaded for a minimum of administrative control. Director Hutchison found differentiation as to scope between station and university research somewhat difficult in practice and favored a policy of close institutional cooperation between them. Director Slate emphasized especially the need of fostering research by insuring a desirable environment for investigators, including their protection from undue demands from graduate students and other distractive influences and the development of agricultural research and teaching along complementary lines.

The problem of an equitable division of time between experiment station and college work of staff members doing both research and teaching was discussed from the point of view of the experiment stations by Directors W. A. Schoenfeld of Oregon and W. W. Burr of Nebraska and, as the representative of the Federal Government, by Assistant Chief R. W. Trullinger of the Office of Experiment Stations. The importance of this problem was brought out in the announcement that of 4,239 station research workers during the fiscal year ended June 30, 1938, 2,072, or nearly 50 percent, were also engaged in teaching. Leaders in education have come to recognize that definite limitations must be imposed on the extent of instructional duties if the most effective functioning is to be expected, and, as Mr. Trullinger pointed out, "it would appear similarly logical and wise that the experiment stations give attention to means for insuring the maintenance of effectiveness in research. The research worker who also teaches should have opportunity for such consecutive time for research, free from interruptions or other demands on his time, as his research projects require. . . . If the project is of such a nature that divided-time workers may be used effectively, it would seem to be wise experiment station policy and in keeping with research grant legislation to make certain not only that the amount of research time allotted them is adequate but also that the time assigned them for teaching and other duties is so distributed as not to interfere with the vigorous and effective prosecution of the research."

The most important development in agricultural research during the past year has doubtless been the provision made by Congress for regional research laboratories in the Agricultural Adjustment Act of 1938 (E. S. R., 78, p. 437). This act, it will be recalled, directed the establishment of four such laboratories to "conduct researches into and to develop new scientific, chemical, and technical uses and new and extended markets and outlets for farm commodities and products and byproducts thereof." Widespread interest has been manifested in these new laboratories and their relations with existing agencies, and the problem of effective coordination has become of outstanding importance. Dr. J. T. Jardine, who was scheduled to open the discussion as Director of Research of the Federal Department of Agriculture, was unable to be present, but a paper embodying his views was presented by Dr. H. G. Knight, Chief of the Bureau of Chemistry and Soils, who has been given charge of the operation of these laboratories. This paper, entitled New Developments in Coordinating Research Administered by the United States Department of Agriculture and That Conducted by the State Stations, drew attention by way of introduction to the many recent attainments in cooperation and coordination, such as the renewal or approval during the fiscal year 1938 alone of formal memoranda of understanding covering nearly 1,000 research undertakings in which all of the State experiment stations and all but one of the bureaus of the Federal Department of Agriculture have participated, the increased cooperation of subject-matter specialists of the stations and the Department in many undertakings but especially in the preparation of the Department's series of agricultural yearbooks, and the progress made in coordination under the Bankhead-Jones Act of 1935, wherein the eighth regional laboratory alone has enlisted the active participation of 25 stations and the Department.

With reference to the new system of laboratories the paper pointed out that from a practical standpoint the program constitutes "a rather clearly defined field or segment of our total research, Nation-wide in scope, and to a considerable extent differentiated, both in objectives and character, from the greater part of our present research. At the same time, this new program is very definitely a part of the research program as a whole, closely related to and dependent upon present research in connection with production, agricultural adjustment, processing, new uses, market outlets, and other lines."

It was estimated that at present perhaps 75 research projects of the Department and 70 projects of the stations are already in operation with the development of new uses for agricultural commodities as their major objective, while about 800 projects of the Department and 1,000 projects of the stations dealing with the solution of problems related to quality, processing, and storage associated with present outlets are closely related. It was suggested that "the present and future research programs of the Department and the State stations within the present fields will need to be examined, and perhaps motivated, to integrate more effectively with the Federal and State program within the fields of the new laboratories." In addition it was shown that perhaps 1,140 industrial laboratories and 71 educational agencies outside the land-grant colleges are conducting research more or less directly related to the field of the laboratory program, and that "agencies of the Federal Government will be conducting research which will need to be taken account of in connection with the laboratory programs and coordination. All of these features will present new problems for careful joint thinking between the Department and the State stations in applying old principles to the new situation."

The relations of the stations to the new program were further considered in papers by Directors R. E. Buchanan of Iowa, Wilmon Newell of Florida, E. C. Johnson of Washington, L. E. Call of Kansas, A. B. Conner of Texas, and J. C. Blair of Illinois and rather extensively by others in the ensuing general discussion. Some diversity of views developed, with suggestions ranging from a virtual relinquishment of the field to an expansion and intensification of effort, but the consensus of opinion seemed to be that although readjustments were essential for a coordinated national program, many of the responsibilities of the stations still remained and that there was much they should do and could do as funds and facilities became available. It was also pointed out that the stations could aid the laboratories in suggesting promising lines of attack, and that some of the discoveries along utilization lines would entail supplementary research by the stations, as in breeding studies and in lowering the cost of production.

One other topic received consideration by the subsection—that of more systematic provision for monographs, critical reviews, and other bibliographical material. The report of the joint committee on projects and correlation of research, presented by Director W. C. Coffey of Minnesota, reviewed the present status of such efforts, indicating that considerable assistance is now being rendered in certain lines but that the coverage is uneven and that a better integration is essential. A program of cooperative effort between the Department of Agriculture, the experiment stations, other research agencies, and the professional organizations was deemed desirable. Among other suggestions the provision of adequate publication facilities, cooperatively supported but under the leadership of the Office of Experiment Stations, and the formation of a national committee in which the stations, the Department, and the National Research Council should be represented were advocated.

In addition to what was done in the public sessions of the station subsection, many administrative matters received attention in a preconvention meeting of directors. This arrangement was found advantageous, though its shifting to a weekday was advocated and the subsection went on record as favoring a change in the opening day from Monday to Tuesday. Should this change become effective it will doubtless put at the disposal of those in attendance greater opportunities both for formal sessions and the many informal conferences which have become an increasingly important phase of the convention's activities.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical work of the Tennessee Station], G. A. SHUEY (*Tennessee Sta. Rpt. 1937, pp. 23–26*).—Work is noted on sorgo sirup, strawberry juice, sweetpotato vinegar, fluorine spray residue, and the furfural yield from cottonseed hull bran.

Electrokinetics.—XVIII, Interfacial energy and the molecular structure of organic compounds.—IV, The electrokinetic behavior of charcoals in aqueous solutions of organic acids, V. L. FRAMPTON and R. A GORTNER. (Minn. Expt. Sta.). (*Jour. Phys. Chem., 41 (1937), No. 4, pp. 567–582, figs. 6; abs. in Minnesota Sta. Rpt. 1937, p. 27*).—In a further study of surface charge phenomena (E. S. R., 77, p. 580) the authors have shown that mobilities of charcoal particles in aqueous solutions of aliphatic acids were the same for propionic, acetic, and formic acids. Adsorption of these acids on the charcoal particles was found to be apolar. On the other hand, adsorption of hydrochloric acid on charcoal is polar, since the charge on the surface of the char suspended in aqueous solutions of this acid increases with an increased concentration of acid, as is typical of inert surfaces in solutions of electrolytes not reversing the sign of the charge.

"Activation" apparently does not affect the electrokinetic properties of charcoal, since the migration velocity of various charcoals suspended in water was found to be remarkably constant. Even graphite and diamond dust showed speeds of the same order of magnitude as the more highly activated carbons. No electrokinetic data were obtained that would support the theory that adsorption of acids and alkali hydroxides on carbon is associated with "acidic" and "basic" oxides of carbon on the surface of the charcoal. No evidence was found that activating charcoal at higher temperatures in the presence of carbon dioxide resulted in a "positively charged" carbon.

Electrokinetics.—XIX, Interfacial energy and the molecular structure of organic compounds.—V, The electric moment of Al_2O_3: Benzene-nitrobenzene interface, R. A. GORTNER and H. B. BULL. (Minn. Expt. Sta.). (*Natl. Acad. Sci. Proc., 23 (1937), No. 5, pp. 256–258, fig. 1*).—It was found that whereas pure benzene produces no electric moment at interfaces, and nitrobenzene produces a high electric moment, when benzene was in excess of 50-mol percent in the mixture the electric moments produced were of small magnitude, while when nitrobenzene was in excess of 50-mol percent in the mixture the electric moments were large. The results are interpreted as being due to a compound of benzene and nitrobenzene in a 1:1 molecular ratio present in the mixture, the nonpolar benzene molecule masking the highly polar nitro group of the nitrobenzene. It is suggested that studies such as these may serve to demonstrate the presence of compounds in solution, under conditions where the direct isolation and identification of such compounds is either extremely difficult or impossible.

Streaming of liquids through small capillaries, H. B. BULL and J. P. WRONSKI. (Minn. Expt. Sta.). (*Jour. Phys. Chem., 41 (1937), No. 3, pp. 463–468, fig. 1*).—The liquids used were the first seven of the normal aliphatic alcohols. Diaphragms of quartz, glass, and cellulose were employed. The rate of flow per unit of pressure through a given diaphragm appears to be a function both of the viscosity of the liquid and of the degree of attraction between the liquid and the material of which the diaphragm is composed. The critical pore radius, below which anomalous flow occurs, lies between 8.85 by 10^{-4} cm and 3.12 by 10^{-4} cm.

The denaturation and hydration of proteins.—I, H. NEURATH and H. B. BULL. **II, Surface denaturation of egg albumin,** H. B. BULL and H. NEURATH. (Minn. Expt. Sta.). (*Jour. Biol. Chem., 115 (1936), No. 2, pp. 519–528, figs. 3; 118 (1937), No. 1, pp. 163–175, figs. 5*).—The two papers here noted record the following observations and conclusions, respectively.

The densities of natural, heat-denatured, and surface-denatured egg albumin were measured. It was found that natural egg albumin had the lowest density and that surface-denatured protein had the greatest density. Heat-denatured protein was intermediate. The volume contraction in water was 53.3 and 24.5 mm^3 per gram for natural, surface-denatured, and heat-denatured protein, respectively. There appeared to be two forms of water in protein systems, loosely bound water and firmly bound water, the former being rather readily altered and the latter highly resistant to removal. Firmly bound water was found to be approximately 0.36 g per gram natural egg albumin, from 0.19 to 0.2 g per gram surface-denatured egg albumin, and from 0.15 to 0.17 g per gram heat-denatured egg albumin. Denaturation was found to be in part a dehydration phenomenon.

It was found that the higher the protein concentration (three concentrations of 2.1, 1.1, and 0.55 percent), the lower was the rate of surface denaturation. The extent of surface denaturation was investigated as a function of pH for salt-free solutions, as well as solutions containing KCl, K_2SO_4, and $BaCl_2$. Surface denaturation is greatly dependent on pH and proceeds fastest at the isoelectric point. The pH was found to change during surface denaturation, and this was studied as a function of pH. *n*-Heptyl alcohol was found to have a marked inhibitory effect on surface denaturation.

The thermal fractions of gluten proteins and their relationship to baking strength, R. H. HARRIS and C. H. BAILEY. (Univ. Minn.). (*Cereal Chem., 14 (1937), No. 2, pp. 182–200; abs. in Minnesota Sta. Rpt. 1937, pp. 38, 39*).—Wet crude gluten was washed from 20 samples of *vulgare* wheat flour and 9 samples of flour milled from various non-*vulgare* wheats. These glutens were then fractionated into three distinct components by dispersion in 0.1 N acetic acid, addition of potassium sulfate, of ethyl alcohol to 50-percent concentration by volume, then progressively lowering the temperature when glutenin came down at 18° to 20° C., mesonin at 8° to 10°. Gliadin was determined upon an aliquot of the residual solution. These fractions were quite distinct in appearance and physical properties, although the mesonin appeared to be intermediate between the other two. Whether the electrolyte was added before or after the alcohol influenced the relative quantities of glutenin and mesonin isolated. Gliadin was also affected to a lesser degree. Addition of the potassium sulfate to the acetic acid dispersion before the alcohol was added (method 2) appeared to yield more satisfactory results in point of clear separation of the respective gluten protein fractions. These results were also in better agreement with the values for glutenin and mesonin previously obtained by other workers.

The quantity of gliadin obtained by fractionating 5 g of wet crude gluten washed from the various flours was significantly and positively correlated with crude protein and loaf volume. This was not true in the instance of the other two fractions. When the three proteins were computed as percentage of flour, positive significant correlations with loaf volume were evident in every case. This was probably due to the influence of crude protein. No further information relative to the loaf volume of the flours appeared to be gained by thermal fractionation of the gluten proteins in addition to that obtained from a knowledge of crude protein. The gliadin *b*: glutenin *b* or gliadin *b*: mesonin *b* ratios were not correlated with loaf volume.

Elasticity of wheat flour dough, L. J. Bohn and C. H. Bailey. (Minn. Expt. Sta.). (*Cereal Chem., 13 (1936), No. 4, pp. 389–409, figs. 6*).—The authors describe a stress meter which can be used to study the stress-strain relations of flour doughs, including a study of plastic flow by measuring the dying out of stress with time of stretching the dough.

Strong flours gave higher stress readings than weak flours when stretched to five times their original length and given various relaxation times. Wheat variety studies showed that high stress meter readings are a good indication of the ability of a dough to withstand prolonged mixing, as shown by baking tests.

Effect of fermentation, certain dough ingredients, and proteases upon the physical properties of flour doughs, L. J. Bohn and C. H. Bailey. (Minn. Expt. Sta.). (*Cereal Chem., 14 (1937), No. 3, pp. 335–348, figs. 5; abs. in Minnesota Sta. Rpt. 1937, p. 23*).—Fermentation decreased the stress readings of flour doughs, indicating that the yield point and elastic properties of the dough decrease and the mobility increases. Sodium chloride markedly increased the stress readings and increased the width of the farinograph curve, indicating that it has a toughening effect upon the gluten. Shortening, within limits, slightly decreased the stress readings. Milk solids-not-fat markedly decreased stress readings after mixing and increased the time of mixing required to reach optimum development as shown in the farinograph. Good-quality milk powders appear to add more to "strength" and give higher stress readings than poor-quality milk powders. They also showed greater tolerance to mixing.

Enzyme papain preparation did not affect stress readings when added to dough in small quantities. Larger additions appreciably decreased stress readings. Barley malt extract and malted wheat flour decreased the stress readings of fermented doughs and appeared to decrease the elastic and increase the mobile properties of dough.

The colloidal behavior of flour doughs.—I, The thixotropic nature of starch-water systems, M. C. Markley. (Minn. Expt. Sta.). (*Cereal Chem., 14 (1937), No. 3, pp. 434–436, figs. 2*).—The viscosity of a starch paste composed of 7 parts of water to 10 parts of wheat starch is at its maximum when the system is quiescent and falls continuously when the system is agitated in a recording dough mixer. Upon stopping the mixer and allowing the system to rest for a time, the original high viscosity is again attained. This indicates that a starch paste is thixotropic in nature and affords a reasonable explanation of the stiffening of doughs upon standing after a severe overmixing treatment.

The influence of individual milling technique on flour and loaf characteristics, M. C. Markley and A. E. Treloar. (Minn. Expt. Sta.). (*Cereal Chem., 14 (1937), No. 3, pp. 305–315*).—Three lots of wheat were aliquoted, and 5-lb. lots of each were sent to 12 cereal laboratories. Each of these laboratories milled the 3 samples according to its own method and sent the flour to the station. Commercially milled flours were also available from each of these 3 wheats. The flours were analyzed for moisture, ash, crude protein, and diastatic activity by a single analyst and the flours were then baked by another technician. In this manner the milling was held as the principal variable between the 13 lots of flour from each of the 3 wheats. The data from the analytical and the baking tests were subjected to statistical analysis. The flours milled at the different laboratories differed significantly in the analytical properties of ash, moisture, protein, and diastatic activity, but were not differentiated in the baking tests.

Seeding test for crystalline beta lactose, P. F. Sharp. (Cornell Univ.). (*Jour. Dairy Sci., 21 (1938), No. 8, pp. 445–449, fig. 1*).—A method and apparatus for testing for the presence of beta lactose crystals in various materials is described. Briefly, a sample of the material to be tested is added to a solution supersaturated with beta lactose and refluxed for a brief period. If the solution remains clear at the end of 10 min. the absence of beta lactose anhydride crystals is indicated. Application of the method for the testing of lactose, dried milk, dried whey, and ice cream is described.

Physical state of lactose as influencing the determination of moisture in dry milk products by the toluene distillation method, P. F. Sharp. H. Doob, Jr., and R. G. Hart. (Cornell Univ.). (*Jour. Dairy Sci., 21 (1938), No. 8, pp. 451–462, figs. 5*).—Data are presented indicating that the amount and physical state of lactose in dried skim milk and dried whey exerts a marked influence upon the rate of moisture removal, longer heating being required when lactose occurs as alpha crystalline anhydrate than when in the crystalline beta anhydride or glass forms. The difficulties in obtaining consistent results in moisture determinations by oven drying and the advantages of the toluene distillation method for determination of moisture in dried milk, dried whey, and dried casein are pointed out.

A comparative study of methods of determining the moisture content of Cheddar cheese.—II, The steam oven method at high pressure and the olive oil methods, I. A. Gould. (Mich. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 7, pp. 379–383*).—Continuing this study (E. S. R., 78, p. 588), a comparison was made of the moisture contents of cheeses as determined by the steam oven method (85 lb. pressure), the regular olive oil method previously described, and a modified olive oil method in which a small amount of salt was added to the oil to prevent spattering during heating. The results obtained by the olive oil method averaged about 0.35 percent lower than those by the oven method, while the modified olive oil test gave results averaging within 0.1 percent of those by the steam oven. Most of the difficulties encountered in the regular olive oil test were overcome by use of this modification. Preliminary results indicated that cottonseed oil was more desirable than olive oil in the open flame method.

Methods for determining salt in various cheeses, J. C. Marquardt (*New York State Sta. Tech. Bul. 249 (1938), pp. 19*).—The modified Volhard method for analyzing cheeses for salt content gave reliable results with young Cheddar, aged Cheddar, Roquefort, blue-veined, Camembert, Limburger, and cottage cheeses. A simple procedure, consisting of direct titration of a water extract of cheese with a standard silver nitrate solution, using either potassium chromate or dichlorofluorescein as an indicator, gave accurate results for the salt content in fresh cheeses less than 5 days of age, but did not give reliable results with aged cheeses. The presence of water-soluble proteins was the principal factor rendering direct titration unsuitable for cheeses over 5 days old.

Determination of iron in biological material, S. H. JACKSON (*Indus. and Engin. Chem., Analyt. Ed., 10 (1938), No. 6, pp. 302–304*).—A method is described for the determination of total iron, using α,α'-dipyridyl as a chromogenic agent and the Evelyn photoelectric colorimeter for the estimation of the color removed. Evidence is presented to show that the development of the color is interfered with in the presence of pyrophosphate and of an unidentified substance or substances present in both the wet and dry ash solutions of foods such as dried tomatoes and spinach. Precipitation with hydrogen sulfide in ammoniacal solution and recovery of the iron by the addition of hydrochloric acid successfully separated the iron from the interfering substances. The method was tested on various materials and the following are some of the values obtained in duplicate determinations: Dried spinach 44 and 44.8 mg, cornstarch 1.8 and 1.8, farina 0.9 and 0.95, milk powder 1.33 and 1.37, Pablum 27.6 and 28, and whole rat 7 and 7 mg of iron per 100 g.

The exclusion of lead from maple sap.—Progress report, C. H. JONES (*Vermont Sta. Bul. 439 (1938), pp. 7*).—The station finds that prompt gathering, prompt boiling, sweet sap, and clean equipment not only aid in lead exclusion but there is greater likelihood that sirup of lighter color and better flavor will be made and higher prices obtained. Among sources of lead contamination terneplate spouts, buckets, pipe lines, tanks, evaporators, buckets which are painted inside with lead, and soldered joints are mentioned. It was shown that lead contamination can be prevented by a protective coating for the sap buckets. Coating materials which have been found satisfactory in respect to lead exclusion, ease of application, low cost, quick drying, insolubility, visibility, lack of taste or odor, and resistance to freezing and stacking injuries included specified makes of aluminum paint and sap bucket enamels containing bakelite resins.

Relation of amylase activity to gassing rate, E. MUNZ and C. H. BAILEY. (Minn. Expt. Sta.). (*Cereal Chem., 13 (1936), No. 4, pp. 427–436, figs. 6; abs. in Minnesota Sta. Rpt. 1937, p. 14*).—In bread-sponge doughs to which no sugar was added the gassing rate was a function of time, diastatic activity, and proportion of bakers' yeast. The rate was fairly constant for 4 hr. or more when the flour used was normal in diastatic activity and an hour or more less when a low-diastase flour was employed. In bread doughs when 3 parts or more of sugar per 100 parts of flour were used in a straight dough the gassing rate was fairly uniform through 6 hr. or more of fermentation. When 6 percent of dry skim milk was superimposed on the sugar-dough formulas, the rate of gas production in both straight-dough and sponge-dough methods was stabilized. In the absence of added sugar the reverse effect was observed in sponge doughs.

The relation of vitamin B_1 to cocarboxylase, M. A. LIPSCHITZ, V. R. POTTER, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Biochem. Jour., 32 (1938), No. 3, pp. 474–484, figs. 2*).—A method is described for the synthesis of cocarboxylase from vitamin B_1 in the presence of boiled tissue extract, hexosediphosphate, and washed dried yeast by atiozymase preparation from brewers' yeast in a solution containing sodium pyruvate. The synthesis is partially inhibited by sodium fluoride and almost completely inhibited by iodoacetic acid. Since neither reagent exerts any inhibitory action on the atiozymase preparation, it is possible to differentiate the free vitamin B_1 and the cocarboxylase in boiled tissue extracts.

A colorimetric method for the estimation of vitamin B_1, H. TAUBER (*Mikrochim. Acta, 3 (1938), No. 2, pp. 108, 109; Ger., Fr. abs., p. 109*).—The principle of the method described is the oxidation of vitamin B_1 to thiochrome in the presence of alkaline potassium ferricyanide solution and the conversion to prussian blue of the ferricyanide formed in the reaction. While the method is quick and the results obtained are fairly accurate, the interference of reducing substances such as glutathione, cysteine, uric acid, and ascorbic acid prevent its application to some biological substances.

Vitamin K: Its distribution and chemical properties; methods of preparation and assay, A. E. Osterberg (*Mayo Found. Med. Ed. and Res., Proc. Staff Mtgs. Mayo Clinic, 13 (1938), No. 5, pp. 72–74*).—A method for preparing a vitamin K concentrate from fish meal is briefly described. Essentially putrified fish meal is extracted with petroleum ether and the ether then removed in a vacuum. The residual oil showed relatively high vitamin K potency.

The chemical concentration of vitamin K, H. Dam and L. Lewis (*Biochem. Jour., 31 (1937), No. 1, pp. 17–21*).—A method for the concentration of vitamin K from alfalfa is described. By this process an oil was obtained which had a potency of about 200,000 biological units of vitamin K per gram.

AGRICULTURAL METEOROLOGY

Climatological research, A. E. Douglass (*Carnegie Inst. Wash. Yearbook, 36 (1936–37), pp. 228–230*).—Reports of progress are given on fundamental studies, cycles and the cyclograph, solar rotation tests, and ring photography (piñon, juniper, charcoal rings, etc.).

Need for research in the field of hydrology, O. W. Monson. (Mont. State Col.). (*Northwest Sci., 12 (1938), No. 2, pp. 26–31, figs. 3*).—This is a brief review of past achievements, with suggested lines for future research in the field of hydrology in its broader sense, including hydrography, hydrognosy, hydrogeology, and hydrometeorology.

An electric hygrometer and its application to radio meteorography, F. W. Dunmore (*Jour. Res. Natl. Bur. Standards [U. S.], 20 (1938), No. 6, pp. 723–744, figs. 22*).—This paper, in the nature of a progress report, deals with the development of an electric-type hygrometer without moving parts or appreciable lag. This makes possible a more rapid ascent and humidity measurements can be made at higher altitudes. This type of hygrometer appears to offer a new tool for measuring humidity in the upper air. It is claimed that further flight tests and the development of means of calibration at low temperatures are all that is now needed to adapt the apparatus to routine measurements.

The radiometer: A simple instrument for the measurement of radiant energy in field studies, J. M. Aikman. (Iowa State Col.). (*Iowa Acad. Sci. Proc., 43 (1936), pp. 95–99, figs. 2*).—The instrument described makes use of the principle of black and white thermometer sets. The main advantages claimed are its greater sensitivity than sets not enclosed in a partially exhausted tube, its simplicity and ease of operation, and the facts that it measures radiant energy rather than merely the visible spectrum and can be moved back and forth during readings to obtain an average reading under mottled shade.

Microbiology of the upper air.—III, An improved apparatus and technique for upper air investigations, B. E. Proctor and B. W. Parker (*Jour. Bact., 36 (1938), No. 2, pp. 175–185, figs. 8*).—Continuing this series by Proctor,[1] the present paper deals with modifications in the bio-aercollector and the laboratory technic involved in its use which minimize contaminations during collection and examination and permit photographic records under aseptic conditions of the nonviable particulate matter comprising the major portion of the collections, thus permitting subsequent culture of the living material therein. Of the organisms collected in the latest series, 16 were bacteria and 19 molds. As these collections are made during flights which simultaneously procure air mass data, the possibility of correlating any particular microorganisms with types of air masses is apparent.

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[1] Amer. Acad. Arts and Sci. Proc., 69 (1934), No. 8, pp. 315–340, figs. 6; Jour. Bact., 30 (1935), No. 4, pp. 363–375.

Tree rings and chronology, A. E. DOUGLASS (*Ariz. Univ. Bul*, *8* (*1937*), *No. 4, pp. 36, figs. 13*).—This monograph deals with the historical study of climate and its value in approaching the prediction of future climatic conditions and in estimating the age of prehistoric human remains. The subject matter is grouped under ring chronologies (including sequoia), the climatic meaning of ring growth (sequoia rain relation, extension of tree-ring methods to other regions, and carmel tree growth and rain), cycle analysis (changing viewpoint regarding cycles, some applications of cyclograph analysis, and application of cyclograph to tree-ring work), solar-terrestrial relation, and the climatic prediction problem.

The extent to which the snow blanket influences the temperature beneath it, W. C. CROXTON and P. NICHOLSON (*Minn. Acad. Sci. Proc.*, *5* (*1937*), *pp. 46–49, figs. 4*).—The results obtained were in general agreement with those of others in showing that a snow cover exerts a marked blanketing effect, and reductions in diurnal temperature changes proved approximately proportional to its thickness. The effectiveness of a light cover seemed to depend considerably on the condition of the snow, fresh snow proving most effective. Changes in temperature beneath the snow tended to lag behind those in the air.

The penetration of light through snow and ice cover, W. C. CROXTON, W. B. THURMAN, and T. SHIFFER (*Minn. Acad. Sci. Proc.*, *5* (*1937*), *pp. 50–53*).—The fraction of light penetrating a snow cover decreased rapidly with its thickness, being imperceptible at 8 in. Contaminations, granular condition, and wetness all tended to diminish penetration. The fraction penetrating proved less at low levels of incident illumination, indicating a difference in quality as well as in intensity. A large fraction of incident light penetrated a clear ice cover at the depths investigated. It seemed apparent that sufficient light penetrates ice to permit photosynthetic activities of most water plants, but probably not where the ice is covered with snow.

Studies in evaporation.—I, Evaporation from an eastward facing slope, W. A. ANDERSON (*Iowa Univ. Studies Nat. Hist.*, *17* (*1938*), *No. 8, pp. 363–370, figs. 4*).—The author presents records of evaporation from Livingston atmometers and Piche evaporimeters leading down to West Lake Okoboji, Iowa. The data showed that evaporation rates are more modified by plant cover than by position on the slope, and there was no indication that they are high enough to inhibit invasion and growth of woodland on any part of this lake bluff.

Droughts, dust storms, and desolation, D. H. DAVIS. (Univ. Minn.). (*Minn. Acad. Sci. Proc.*, *5* (*1937*), *pp. 5–15, fig. 1*).—This is a general, historical, and explanatory discussion with reference to the Great Plains area of the United States, all parts of which suffer from a deficiency in annual precipitation coupled with a high evaporation rate in the warm months. This natural high evaporation rate has been affected unfavorably by man's use of the area, this decreasing the effectiveness of the light precipitation. The climate in different parts is of the dry hot or dry cold steppe types, with various short grasses as the typical native vegetation. The initial disturbance of nature's balance came through overgrazing and agricultural settlement intensified the problem, one of the byproducts of which has been the increased wind erosion. The major damage of the dust storms consists in the removal of the productive soil from these overgrazed or cultivated areas. Any program for improving these conditions should involve halting and reversing depletion, checking erosion and rebuilding the soil, restoring depleted ranges, and placing the latter under efficient management.

Drought of 1936, with discussion on the significance of drought in relation to climate, J. C. Hoyt (*U. S. Geol. Survey, Water-Supply Paper 820 (1938), pp. IV+62, pls. 2, figs. 18*).—The author discusses the causes (deficient and unsatisfactorily distributed precipitation, accompanied by high temperatures and warm winds); the effects on ground and surface water, including the stability of the water supply and the decline of lake levels; damage to vegetation, domestic and industrial water supplies, health, power, navigation, and to recreation and wild life; the question of relief in affected areas; major drought years in humid and semiarid States; droughts as related to the semiarid States; the shelter belt; natural vegetation and soils of the Great Plains in relation to climate; droughts as related to crops and to the classification of climate; and variability of climate and climatic risks. An article entitled Backgrounds of Economic Distress in the Great Plains (by H. L. Walster, N. Dak. Expt. Sta.) is appended.

The effect of climatic regions, A. J. Winkler. (Univ. Calif.). (*Wine Rev., 6 (1938), No. 6, pp. 14–16, 32*).—Within the geographical zones where the grapes of the world are grown there are wide differences in environal conditions among the regions. Differences in soil type, humidity, etc. occur, but the best understood and most important factor is temperature. The long-time experience in Europe has shown the effects of climate to be largely through its influence on the rate of changes in the constituents during development and on the composition of the grapes at maturity. Relatively cool conditions, with these changes proceeding slowly, have been found most favorable for producing quality dry wines. The very hot regions, unsuited to dry wine production, are ideally fitted for fortified wines. Thus, when accompanied by proper methods of vinification and aging, the regional conditions determine the type of wine to be made, while the variety determines the quality within the type.

Records indicate that California has almost as wide a spread in climatic conditions as occurs in all of Europe. These comparative figures (tabulated) give a general indication of the possibilities of the State for production of a variety of wine types. The importance to the State of adapting grape varieties and wine types to regional climatic conditions, rather than trying to produce everything everywhere, is stressed.

[Climatic conditions at the United States Field Station, Sacaton, Ariz.], C. J. King, R. E. Beckett, and O. Parker (*U. S. Dept. Agr. Circ. 479 (1938), pp. 2–8*).—Tabulated summaries and discussions are given for data on temperatures, rainfall, evaporation, and wind velocities over periods of years.

Influences of climate on the cultivation of citrus fruits, E. A. Ackerman (*Geog. Rev., 28 (1938), No. 2, pp. 289–302, fig. 1*).—This is a critical analysis and review (with bibliographic footnotes) of the relationships of climatic factors to citrus culture throughout the world, including critical temperatures, types of frost trouble and means of natural and artificial protection, moisture influences, problems of irrigated and nonirrigated regions, and climatic costs. A world map indicates the regions of commercial production.

The weather and the tobacco crop (*Tobacco Inst. Puerto Rico Rpt., 1 (1937), pp. 17, 19, 21*).—A brief general discussion, with tabulated precipitation records for the principal tobacco districts of Puerto Rico included.

SOILS—FERTILIZERS

The principles of soil science, A. A. J. de Sigmond, trans. by A. B. Yolland, edited by G. V. Jacks (*London: Thomas Murby & Co., 1938, pp. XIV+362, pls. 4,* *figs. 34*).—A foreword by E. J. (Sir John) Russell notes, in part, that "the main theme . . . is the presentation and discussion of the system of soil classification already known internationally by the author's name, but never before described in detail in an English publication . . . Every country possesses certain soil types not found elsewhere; certain English soils, for example, do not easily fit into Prof. de Sigmond's system, and certain Hungarian soils fit into no English system. The comprehensive classification here proposed, based essentially on the chemical composition of the soil, is not intended to be final, but it satisfactorily fills many gaps in other systems, and leads us a considerable step further toward the goal of every soil taxonomist—a universal classification based on strictly scientific principles."

Following the foreword, author's preface, and an introduction concerned with "soil science and its field," the book is in four parts, of which the first, soil genetics, takes up geological and petrographic soil-forming factors, climatic soil-forming factors, orographical (local) and hydrographical conditions as soil-forming factors, natural vegetation as a soil-forming factor, animals as soil-forming factors, micro-organisms as soil-forming factors, the age of soils—time as a soil-forming factor, man as a soil-forming factor, and the principal soil-forming reactions. Part 2, agronomy, considers local soil surveys and chemical properties of soils and their characterization. Part 3, soil systematics, includes the general soil system, characterization and further classification of soil types, and physical and physiological classification of local varieties. Part 4, principles of soil cartography, discusses various types of soil maps, laws governing the geographical distribution of soil types, and to what extent does the actual distribution of soil types agree with the general soil system. The book has both subject index and author index.

Micropedology, W. L. KUBIËNA (*Ames, Iowa: Collegiate Press, Inc., 1938, pp. XVI+243, figs. 132*).—Having demonstrated the important bearing of micropedology upon soil morphology and soil dynamics, the author is convinced that there will be a time "when no pedologist can be without the use of the microscope," and he has provided a thorough textbook on this subject. He does not consider that micropedology should be, or that it will remain, a specialized and separated branch of soil science. On the contrary, micropedology "will remain a special branch only so long as the recognition of the possibilities and necessities of the use of microtechnic in pedology does not become common to all."

Part 1, general, consists of two chapters on the principle of micropedology and use and development of microtechnic in other natural sciences. Part 2, on the technic of micropedology, covers incident light microscopes, the soil microscope, performance of micromanipulations, microscopic field investigations, soil sampling, soil preparations, fabric reactions, optical methods, and microchemical methods. Part 3, on soil fabrics, has the following contents: Introductory, elementary fabric, fabric or aggregates and detachment bodies, and fabric types in coherent soils. Part 4, dealing with biological soil microscopy, takes up characteristics of the microhabitat, soil fabrics and soil biology, observations on humus formation, and the soil microflora and fauna observed by direct microscopy. The book contains a short reference list, a subject index, and a brief author index.

[Introductory statements concerning soils], G. HAMBIDGE (*U. S. Dept. Agr. Yearbook 1938, pp. 20–44*).—The author here takes up, for the most part nontechnically, soil deficiencies, the use of rotations and organic materials, the use of fertilizers and lime, erosion control, some special areas and problems, soil and plant relationships, and fundamentals of soil science, including the physics, chemistry, and biology of the soil and the formation and classification of soils.

Soil and society, C. E. KELLOGG (*U. S. Dept. Agr. Yearbook 1938, pp. 863-886, figs. 5*).—The author discusses the broader types of soil as an influence on type of civilization, effect of the migration of a people from a familiar to an unfamiliar type of soil, and other relations of human social systems to their soils, concluding with an outline of the development of soil science.

[Soils and fertilizers] (*Tennessee Sta. Rpt. 1937, pp. 5, 6, 8, 18-23*).—Work in cooperation with the T. V. A. included field experiments with phosphates, control experiments with various phosphates in rims. and rapid methods for determining the fertilizer requirements of a soil (coop. Wis. Expt. Sta. et al.). Other soil work, by W. H. MacIntire and W. M. Shaw, is reported on comparative behavior of variant forms of lime and magnesia, conservation of lime and magnesia from economic additions, lime-potash studies, conservation of soil sulfur, migration of phosphates, the relation between phosphates and fluorides in the soil, nitrogen conservation, and the role of component fluorides in causing a retrogradation of P_2O_5 availability.

[Soil researches at the Vermont Station] (*Vermont Sta. Bul. 438 (1938), pp. 18-20, 21*).—This work has included the use of boron in correcting the overliming of acid soils (E. S. R., 77, p. 754); conservation of stable manure (E. S. R., 79, p. 166) and carbon: nitrogen ratios; plants beneficial in flood and riverbank erosion; and factors affecting the reliability of rapid soil tests.

Formation of soil, H. G. BYERS, C. E. KELLOGG, M. S. ANDERSON, and J. THORP (*U. S. Dept. Agr. Yearbook 1938, pp. 948-978, figs. 2*).—A brief popular outline of the development from parent rock to mature soil is followed by a slightly more technical section on the differences that characterize the various groups of soils.

Soil classification, M. BALDWIN, C. E. KELLOGG, and J. THORP (*U. S. Dept. Agr. Yearbook 1938, pp. 979-1001*).—Modern soil classification is explained, and the characteristics and uses of the great groups of soils throughout the world are stated. An appendix classifies soils on a characteristics basis.

Soil maps and their use, J. K. ABLEITER (*U. S. Dept. Agr. Yearbook 1938, pp. 1002-1015, figs. 7*).—The author outlines the preparation of soil maps and explains how, with their accompanying descriptions, soil maps are invaluable guides to efficient use of the soil and to intelligent planning.

Soils of the United States (*U. S. Dept. Agr. Yearbook 1938, pp. 1019-1161, figs. 57, map 1*).—The zonal soil groups and areas of the United States are systematically described. A map depicting the soil associations of the United States, Alaska, Hawaii, Puerto Rico, Virgin Islands, and Canal Zone is given.

[Soil Survey Reports, 1932 and 1933 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1932, No. 27, pp. 38, figs. 2, maps 2; 1933, No. 20, pp. 49, figs. 2, map 1*).—These surveys were made in cooperation with the University of Nebraska: 1932, No. 27, Holt County, Nebr., W. J. Moran et al.; and 1933, No. 20, Brown County, Nebr., E. A. Nieschmidt et al.

Soils of Petroleum County: Soil reconnaissance of Montana—Preliminary report, L. F. GIESEKER. (Coop. U. S. D. A.). (*Montana Sta. Bul. 363 (1938), pp. 47, fig. 1, maps 4*).—This report adds 1,667 sq. miles to the parts of Montana covered by the State reconnaissance survey.

The physical nature of soil, T. D. RICE and L. T. ALEXANDER (*U. S. Dept Agr. Yearbook 1938, pp. 887-896, figs. 5*).—The authors point out the complexity of soils and of the forces combining to produce them, discussing briefly the life history of soils, causes of regional soil differences, the nature of profiles and the information yielded by them, and the significance of color, texture, and structure.

General chemistry of the soil, H. G. Byers, M. S. Anderson, and R. Bradfield (*U. S. Dept. Agr. Yearbook 1938, pp. 911–928, figs. 2*).—The first part of this paper deals nontechnically with the simpler facts regarding soil colloids, base exchange, acidity, and the soil solution. The last part deals with these subjects in more detail.

Soil organic matter and soil humus, C. C. Nikiforoff (*U. S. Dept. Agr. Yearbook 1938, pp. 929–939, fig. 1*).—This article briefly defines soil humus, pointing out its functions and discussing the factors which determine the supply and the rate of consumption, variation among the humus contents of soils of different type, and the relation of humus to productivity.

Some physical and chemical properties and the kind of organic matter affecting color in Randall clay and upland soils of the southern high plains, H. A. Daniel and W. H. Langham. (Okla. Expt. Sta.). (*Soil Sci., 45 (1938), No. 5, pp. 369–385, pl. 1, fig. 1*).—Randall clay and adjacent typical well-drained upland soil were analyzed. Randall clay was dark gray or black and contained 29.7 percent less sand, 41.3 percent more clay, 27.1 percent less total nitrogen, 27.7 percent less organic matter, and more hygroscopic moisture in the surface foot than did the upland soil. It also contained less total carbon, carbonates, and organic carbon, but there was no apparent difference between them in percentage of inert carbon. The carbon : nitrogen ratios in both soils were within the normal range of soils recorded by other investigators. The lignin and protein (humus) : nitrogen ratios were considerably higher in Randall clay, and the cellulose : nitrogen ratios were higher in the upland soil. The surface of the clay areas contained an average of 9.3 percent more waxes and gums (benzene and alcohol extract), 26.99 percent more lignin, 31.37 percent less cellulose, and 3.39 percent less protein than did the upland soils. The greatest difference in the composition was in the humus content. Although the Randall clay contained more iron and manganese than did the upland soils, the total percentage was very low, and the data obtained show that these elements were not the important factors affecting the color of the dark-gray or black clay soils. The data reported indicate that the color in these fine-textured soils formed on lacustrine deposits is more closely associated with the character of organic matter present than with the quantity of total organic matter, nitrogen, or mineral in the parent material or with the texture.

On the detection of nitrate reduction, H. J. Conn. (N. Y. State Expt. Sta.). (*Jour. Bact., 31 (1936), No. 3, pp. 225–233*).—The author points out that to describe an organism as not reducing nitrates unless nitrites or gas production can be detected in a nitrate medium is inaccurate in many cases. "His chief recommendation in regard to nitrate reduction is that, for diagnostic purposes, authors of bacterial descriptions confine themselves to the following statement: 'Nitrite produced (or not produced) from nitrate on . . . medium in . . . days.' Such a statement is not misleading, and is probably as valuable for diagnosis as one based on a painstaking determination of the end products in such a medium, designed to show whether or not nitrate reduction has actually taken place. If the author of such a species desires to give a little further information, the following statement may be added: 'Nitrate completely consumed (or not consumed) after . . . days.' Both of the above statements are based on simple tests that can easily be employed, even on a long series of cultures studied simultaneously. A positive result in either case indicates nitrate reduction; and although a negative result does not indicate nonreduction, it is not misleading when stated as above."

Comparative effects of cotton and alfalfa culture on the distribution of soluble salts in the soil, C. J. KING, R. E. BECKETT, and O. PARKER (*U. S. Dept. Agr. Circ. 479 (1938), pp. 39–43, fig. 1*).—In the upper 4 ft. of plats planted to alfalfa at Sacaton, Ariz., there was a slight reduction in the salinity as determined by conductivity measurements. Alfalfa was found to be useful for the prevention of excessive accumulations of soluble salts at least in the upper part of the root zone in soils of this character.

Fauna and flora of the soil, C. THOM and N. R. SMITH (*U. S. Dept. Agr. Yearbook 1938, pp. 940–947*).—The great extent and variety of microscopic soil life is briefly noted, together with the work, beneficial or harmful, done by each kind of organism.

Plants as soil indicators, H. L. SHANTZ (*U. S. Dept. Agr. Yearbook 1938, pp. 835–860, figs. 8*).—The author describes the native plant and soil correlations throughout the United States, listing plants that indicate soil-moisture conditions, good agricultural or grazing land, and (in the West) land that is good, medium, or poor for small grains, forage, and grazing.

The soil requirements of economic plants, M. F. MORGAN, J. H. GOURLEY, and J. K. ABLEITER (*U. S. Dept. Agr. Yearbook 1938, pp. 753–776, figs. 2*).—Some favorable conditions can be brought about, under certain circumstances, by management practices; others must be inherent in the soil. Following a brief discussion of these general soil requirements, the article takes up the important crop plants in alphabetical order, describing the soils most suitable for each.

Water relations of soils, L. B. OLMSTEAD and W. O. SMITH (*U. S. Dept. Agr. Yearbook 1938, pp. 897–910, figs. 4*).—This article presents a largely nontechnical discussion of water-holding capacity, states in which the soil water is found, availability and its measurement, soil or dust mulch, management of sticky soils, etc.

General aspects of the soil-erosion problem, H. H. BENNETT and W. C. LOWDERMILK (*U. S. Dept. Agr. Yearbook 1938, pp. 581–608, figs. 12*).—The authors describe water and wind erosion of unprotected soil and the extent and distribution of the damage it has done in this country, including the loss of topsoil and soil nutrients. They deal briefly with the economic aspects of erosion and summarize the principal steps that may be taken to control it, adding their conception of the requirements of a national soil conservation program.

The problem: The Nation as a whole, E. J. UTZ, C. E. KELLOGG, E. H. REED, J. H. STALLINGS, and E. N. MUNNS (*U. S. Dept. Agr. Yearbook 1938, pp. 84–110, fig. 1*).—This article discusses the nature of the soil losses resulting from cropping, leaching, and erosion in the United States; the extent of the losses by erosion; the effects of these losses on crop yields; how much land can be safely cultivated under present practices and under improved practices; to what extent erosion losses offset the improvements in agriculture in modern times; and the effects of soil erosion in increasing floods, on sedimentation of navigable streams, and on water conservation.

The story of one heavy rainstorm (*Farm Res. [New York State Sta.], 4 (1938), No. 4, p. 4*).—During a total rainfall of 4.5 in. over a period of 12 hr., with maximum intensity of 6 in. per hour, plats at the station gave maximum losses of soil and water on a fallow plat of Dunkirk soil. About 66 percent of the total rainfall was lost as run-off, carrying with it 46 tons per acre of topsoil. This very severe loss occurred on a very moderate 5 percent slope. On a steeper slope, a fallow plat on the somewhat more permeable Ontario soil lost 52 percent of the rainfall as run-off, and 24 tons per acre of soil.

A similar fallow plat of Ontario soil, on which a green manure crop of rye had been turned under, lost 42 percent of the rainfall as run-off, and 13.5 tons per acre of soil. "Corn across the slope on Dunkirk soil allowed a 28 percent loss of rainfall as run-off accompanied by an 8 tons per acre soil loss. . . . A red clover plat lost 5.5 percent of the rainfall, and only 89 lb. of soil per acre. Soybeans and grass lost less than 1 percent of the rainfall and 30 and 10 lb. per acre, respectively, of soil."

Erosion on roads and adjacent lands, A. M. Davis (*U. S. Dept. Agr. Leaflet 164 (1938), pp. 8, figs. 9*).—A popular discussion, including suggestions for the control of this type of erosion.

Loss of soil organic matter and its restoration, W. A. Albrecht (*U. S. Dept. Agr. Yearbook 1938, pp. 347–360, figs. 3*).—The author points out that the soil organic matter may well be regarded as the most important of our national resources, it being the source of energy for necessary bacterial activities which set free plant nutrients, an important factor in soil structure, a part of the base-exchange material of the soil, and a source of nitrogen. He shows that many farm practices greatly reduce the original organic matter resources of the soil and points out the lowered agricultural efficiency which must follow failure to counteract this waste. The problems involved in maintaining an adequate supply of organic matter in the soil are dealt with from a practical standpoint.

The coordinated approach to soil-erosion control, E. J. Utz, (*U. S. Dept. Agr. Yearbook 1938, pp. 666–678, figs. 3*).—The author shows, from past results, that usually several practices must be combined to fit a particular area or farm. The first part of the article discusses what is needed for a coordinated attack on the erosion-control problem in the dry or subhumid regions of the United States and in the humid regions. The second part details a coordinated approach carried out on three representative farms in North Carolina, Illinois, and South Dakota.

Mechanical measures of erosion control, M. L. Nichols and T. B. Chambers (*U. S. Dept. Agr. Yearbook 1938, pp. 646–665, figs. 6*).—This article describes methods that may be applied to cultivated land, such as ditches for the interception of water, absorption and drainage terraces, basin listing, contour furrowing, bench terraces, and special measures for irrigated land; measures adaptable to pasture and range land; and the building of channels adequate to carry run-off, followed by a discussion of the control of destructive gullies. Mechanical measures that may be used to reduce wind erosion are also dealt with.

Soil-depleting, soil-conserving, and soil-building crops, A. J. Pieters (*U. S. Dept. Agr. Leaflet 165 (1938), pp. 8, figs. 3*).—The author describes as "soil depleting" any crop which brings about destruction of the organic matter (as by requiring excessive cultivation) or so exposes the soil as to cause the loss, by erosion, of minerals in excess of those taken off in the crop itself. Noncultivated crops conserve soil organic matter, regarded as the most important point, and their close-growing habit protects from erosion. Soil-building crops are those which increase the organic matter supply. For soil building the author considers grass sod the most important. However, "green manuring combined with erosion-control practices should maintain the productivity of the soil."

Grass and other thick-growing vegetation in erosion control, C. R. Enlow and G. W. Musgrave (*U. S. Dept. Agr. Yearbook 1938, pp. 615–633, figs. 7*).—The authors emphasize grass and other thick-growing vegetation as nature's method of erosion control. Striking recent observations of the conservation of soil and water effected by such cover are noted, together with the best methods for the use of vegetative cover in actual farm practice. Plants now under development in nurseries are listed, with their qualities and adaptations.

Strip cropping, W. V. Kell (*U. S. Dept. Agr. Yearbook 1938, pp. 634–645, figs. 6*).—The author notes the increasing use of strip cropping as a practical method of erosion control on sloping lands. He shows the beneficial results of the practice, gives directions for laying out the strips, and touches on the place of strip cropping in the farm rotation.

Tillage, J. S. Cole and O. R. Mathews (*U. S. Dept. Agr. Yearbook 1938, pp. 321–328*).—The authors discuss the questions of how much tillage is best; whether a fine or a coarse surface is the better; the effect of tillage on the supply of nitrogen, on plant diseases, and on insects; and its place in erosion control.

Soil nitrogen, O. Schreiner and B. E. Brown (*U. S. Dept. Agr. Yearbook 1938, pp. 361–376, figs. 6*).—In a largely nontechnical discussion the authors take up such phases of the subject as the general role of nitrogen in life processes, the primary source of soil nitrogen, the nitrogen cycle, how nitrogen gets into the soil, nitrogen distribution in soils of the United States under natural conditions, the relation of temperature to the amount of nitrogen in soils, the distribution of nitrogen in soils according to depth, nitrogen an important factor in maintaining soil fertility, how soil-nitrogen losses occur, nitrogen forms utilized by plants, and nitrogenous organic constituents of soils.

Phosphorus deficiency and soil fertility, W. H. Pierre (*U. S. Dept. Agr. Yearbook 1938, pp. 377–396, figs. 4*).—The author calls attention to the fact that although low production is due more often to lack of phosphorus than to the lack of any other element, there is a wide difference in the deficiency of phosphorus in different soil types. He discusses the phosphorus content of various soils in the United States, depletion of the supply of phosphorus in the soil, the available forms of phosphorus as distinguished from the unavailable forms, the crop plants which respond most to additions of phosphorus, and the influence of liming on phosphorus availability.

Soil potassium in relation to soil fertility, H. P. Cooper, O. Schreiner, and B. E. Brown (*U. S. Dept. Agr. Yearbook 1938, pp. 397–405*).—This paper briefly discusses the topics, quantity of potassium in soils, potassium removed by crops, sources of fertilizer potash, potassium consumption in the United States, need for and effects of potassium, amounts of available potassium required for various crops, and the potash cycle.

The composition and structure of soil organo-mineral gels and soil fertility, A. T. Tyulin (*Soil Sci., 45 (1938), No. 5, pp. 343–357, figs. 2*).—By methods of fractional peptization and fractional coagulation the author separated the organic matter associated with the mineral soil colloids into a loosely bound fraction and a fraction not removed by more vigorous reagents. He considers that "the quantity and the composition of the loosely held humates in soil colloids may serve as a valuable criterion of soil fertility or of the extent to which the soil can be cultivated."

Titration curves and dissociation constants of soil acidoids, A. N. Puri and A. G. Asghar (*Soil Sci., 45 (1938), No. 5, pp. 359–367, figs. 8*).—Titration curves of soil acidoids closely resembled those of weak dibasic acids. The point of inflection occurred approximately 4 pH units above the initial pH of the acidoid and corresponded to the neutralization of the first hydrogen.

Dissociation constants of soil acidoids were determined from their titration curves.

Evaluation of the influence of nitrogenous fertilizers on the acid-base status of soils by lysimeter studies, M. F. Morgan and E. M. Bailey. (Conn. Expt. Sta.). (*Soil Sci., 45 (1938), No. 5, pp. 387–401, pl. 1, figs. 6*).—The work here recorded was carried out by means of a lysimeter installation at Windsor, Conn., tanks of 9-, 20-, and 30-in. depth having been provided for observations of the behavior of surface soil alone, surface soil with upper subsoil, and surface soil with full subsoil, respectively.

Acid-reacting fertilizers, by increasing losses of basic constituents through leaching, tended toward increased unsaturation of the base-exchange complex. Soils that have a high initial base content become depleted of bases by the treatment to a degree approaching that theoretically calculated from assumptions based on the stoichiometry of their biological decomposition products. On the other hand, soils of low exchangeable base content cannot supply sufficient amounts of readily active calcium, magnesium, potassium, or sodium to combine with the anions liberated in the process; hence, the change in base status resulting from acid-reacting fertilizers on such soils is much diminished. The disappearance of bicarbonate as an effective anion in base depletion by leaching under strongly acid conditions also tends to produce less than the expected increase in base loss.

Results under tobacco cropping show that Pierre's assumption (E. S. R., 59, p. 120) of an intake of nitrogen by the tobacco crop corresponding to twice its base equivalence is not applicable in all cases, especially for a high-ash crop. Experiments in adjustment of acid-reacting fertilizers indicate that, in the absence of a crop, the use of calcium carbonate in amounts equivalent to the theoretical acidity of the fertilizer tends to stabilize the soil at approximately its initial pH. Leaching data to date in this uncompleted experiment, however, seem to indicate that calcium has been added in greater amounts than have been required to replace the equivalent base leaching. Sodium nitrate had a greater effect in raising the pH than could be explained from its effect upon total base saturation. This is considered to be due to the increase in the proportion of monovalent cations in the base-exchange complex. Incomplete results with several other nitrogenous materials give data indicating effects commensurate with the character of the nitrogen source.

Effects of phosphorus and lime in reducing aluminum toxicity of acid soils, K. E. Wright. (R. I. Expt. Sta.). (*Plant Physiol., 12 (1937), No. 1, pp. 173–181*).—To determine the nature of the injury of plants due to soil acidity, the author grew beets in an acid soil, and in such a soil treated with lime, with superphosphate, and with calcium lactate separately, and also carried out other experiments which indicated aluminum as the cause of the poor growth in acid soils and showed the probable nature of its action.

The soil experiments showed that the low pH of the acid soil per se could hardly be the cause of the poor growth, since good growth was obtained with superphosphate treatment alone as well as with lime alone, and some improvement appeared under calcium lactate treatment, whereas the pH value was practically unaltered except by the lime. It was also shown that neither a deficiency of calcium as an essential element nor photosynthesis can be considered limiting factors in growth, as all plants contained as much as or more calcium than those grown in the limed flat, no magnesium deficiency was discovered, and there was an accumulation of both total and reducing sugars in the plants grown in the acid soil.

Deficiencies of total nitrogen, of nitrates, and of phosphorus in the plants from the acid soil revealed possible causes of retarded growth in acid soil, however, and drip culture experiments with beets indicated a phosphorus deficiency as the possible cause of retarded growth and the presence of aluminum as the probable cause of this deficiency. When barley was grown in drip culture solutions wherein the root system was divided, each half being placed in separate containers and receiving different culture solutions, analysis of the plants indicated that (1) damage to the plant as a whole is probably the result of the poor root system caused by the presence of aluminum; (2) aluminum is precipitated immediately in that half of the root system in direct contact with aluminum, whereas the other half of the root system not in contact with aluminum, and the tops, grow practically as well as the check plants; and (3) in that series where each half of the root system is in a culture solution containing both aluminum and phosphorus, internal precipitation evidently plays an important part in retarding growth, since, if the precipitation were external, the fairly large amounts of aluminum and phosphorus found inside the roots of these plants could not be satisfactorily explained. The corrective action of large applications of superphosphate to acid soils is attributed largely to the internal precipitation of aluminum by phosphorus with sufficient phosphorus remaining for the metabolic processes of the plant.

Soil acidity and liming, E. Truog (*U. S. Dept. Agr. Yearbook 1938, pp. 563–580, figs. 4*).—The author finds that in the North-Central States the annual loss of lime (as calcium oxide) is from 50 to 250 lb. per acre over and above that returned in the form of manures and crop residues. The main obstacle to a balancing of the lime budget is the lack of an adequate supply of low-cost liming materials. The relation of soil reaction to plant growth, the nature and use of rapid chemical tests, and the nature and functions of the acids in the soil are also discussed.

Determining the fertilizer requirements of soils, O. Schreiner and M. S. Anderson (*U. S. Dept. Agr. Yearbook 1938, pp. 469–486, figs. 5*).—The authors present a critical comparative discussion of the rapid chemical soil tests; the biological tests, including the Neubauer method (E. S. R., 53. p. 319) and the bacterial and mold tests; greenhouse methods; and field plat methods.

Rapid soil tests help to remake Wisconsin agriculture, E. Truog. (Univ. Wis.). (*Com. Fert., 54 (1937), No. 1, pp. 26. 27*).—By means of rapid tests it has been found that about 85 percent of the soils of Wisconsin need lime, 75 percent need phosphate fertilizer, and 65 percent need potash fertilizer for the successful growing of alfalfa. The State testing laboratory, established about 25 yr. ago. now examines an average of about 1,000 samples each month.

Selecting fertilizers, A. R. Merz (*U. S. Dept. Agr. Circ. 487 (1938), pp. 16, figs. 3*).—This circular presents a nontechnical description of nitrogen sources, inorganic and organic, phosphates, and potassium compounds used as fertilizers. The nature of fertilizer mixtures is briefly noted, and advice with respect to selection of fertlizers accordng to soil and crop and according to plant-food concentration is given. Granulation of fertilizer mixtures to avoid segregation of components and prevent caking and stickiness is mentioned. The importance of correct placement is touched upon very briefly, as are also mechanical distributing devices.

Fertilizer materials, O. Schreiner, A. R. Merz, and B. E. Brown (*U. S. Dept. Agr. Yearbook 1938, pp. 487–521, figs. 6*).—The authors briefly outline the stimulation of the fertilizer industry in this country by the World War demand for domestic production and proceed to a general discussion of the sources of nitrogen, phosphorus, potassium, and some elements not commonly used in fertilizers. Certain effects of fertilizer materials are next considered. A detailed appendix describes the commercial materials now available and their uses, together with some materials still in the experimental stage.

Mixed fertilizers, W. H. Ross and A. L. Mehring (*U. S. Dept. Agr. Yearbook 1938, pp. 522–545, figs. 4*).—This article takes up commercial mixing, the nature of high- and low-analysis mixtures, physical properties of a good mixed fertilizer, good and bad effects of fertilizers on plants, and means by which the farmer may reduce fertilizer costs.

Methods of applying fertilizers, R. M. Salter (*U. S. Dept. Agr. Yearbook 1938, pp. 546–562, figs. 3*).—The author discusses broadcasting v. placing in the row close to the plants and the effects of the two methods on rapidity of growth and time of maturity, on injury by drought, and on the availability of nutrients. He also takes up the best placement and the question of applying fertilizer all at once or at different times. Recommended methods for important crops are described.

"No single fertilizer pattern has been found superior with all crops and under all conditions. Almost without exception, however, in the numerous comparisons that have been made, placing the fertilizer at the sides of the seed or plant has been most efficient."

Supplementary or side-dressing application of fertilizer, C. B. Sayre (*Farm Res. [New York State Sta.], 4 (1938), No. 4, pp. 3, 4, figs. 2*).—The author finds side dressings to be effective (1) in very sandy soils where the fertilizer ingredients may be carried off in leaching before the end of the growing season, (2) in soils where the phosphorus and potassium are "fixed" quickly in an insoluble form, (3) when heavy rains early in the season have leached out the nitrogen which is indicated by pale leaves and a slow growth of the crop, (4) when cold, wet weather prevents nitrification or the natural formation of nitrates in the soil by the action of soil bacteria, and (5) with some crops, notably sugar beets, when growers wait to see if a good stand is obtained before applying fertilizer to the crop. He outlines practical methods for applying side dressings with necessary precautions to avoid injury to the plants. In experiments on a nearly neutral Ontario loam with five nitrogen sources, and with tomatoes as the test crop, ammonium sulfate gave the best results, followed by sodium nitrate. Calcium nitrate. Calurea, and urea did not give profitable increases in yield in these experiments.

Experiments with fertilizers, lime, manure, and crop rotations (*Ohio Sta. Spec. Circ. 53 (1938), pp. 55–98, fig. 1*).—In tables with explanatory notes this part of the circular shows profits and losses from a wide variety of fertilizer, lime, and manure applications with various rotations of crops.

Farm manure, R. M. Salter and C. J. Schollenberger (*U. S. Dept. Agr. Yearbook 1938, pp. 445–461, fig. 1*).—From the 1 billion tons of farm manures produced on American farms it should be possible to obtain 3 billion dollars' worth of crop increases, but only a small part of this value is secured in practice. The authors discuss the values, preservation, and proper use of such material.

The nature and use of organic amendments, I. C. Feustel (*U. S. Dept. Agr. Yearbook 1938, pp. 462–468, fig. 1*).—The author discusses the limitations as well as the uses of the various organic materials which are fitted for farm use for increasing the organic matter of the soil. The most important of such materials are considered to be the various plant wastes and peats.

Neglected soil constituents that affect plant and animal development, J. E. McMurtrey, Jr., and W. O. Robinson (*U. S. Dept. Agr. Yearbook 1938, pp. 807–829, figs. 4*).—The authors discuss elements known to be essential in traces, with some others of which it is not yet certainly known whether they are or are not essential, and mention a number of known deficiency diseases of plants.

Applicability of nutrient-solution purification to the study of trace-element requirements of Rhizobium and Azotobacter, R. A. STEINBERG (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *57* (*1938*), *No. 6, pp. 461–476*).—The use of nutrient-solution purification (E. S. R., 74, p. 616) led to a slight improvement in results in studies of the trace-element requirements of *R. trifolii* and *A. chroococcum*, even at low nutrition levels. The results were quite similar in general to those previously reported for *Aspergillus*. No evidence that the need of these bacteria for an essential element is not specific and almost absolute could be obtained. Evidence affording additional proof of the essentiality of coenzyme R for growth of *Rhizobium* was obtained. The necessity of a second accessory growth factor is also indicated. For this the name "rhizobiosin" is proposed.

Selenium in soils, K. T. WILLIAMS (*U. S. Dept. Agr. Yearbook 1938, pp. 830–834*).—The identification of selenium as the toxicant responsible for "alkali disease," the area of incidence of this disease, and the present status of the selenium problem are dealt with briefly.

AGRICULTURAL BOTANY

The structure and development of the fungi, H. C. I. GWYNNE-VAUGHAN and B. BARNES (*Cambridge, Eng.: Univ. Press, 1937, 2. ed., pp. XVI+449, pl. 1, figs. 309*).—In this edition of the textbook previously noted (E. S. R., 61, p. 513) much new material has been included. The importance of flagellation as a guide to Phycomycete interrelationships is emphasized, and data on heterothallism in the rusts and many new life histories have been added.

Association effects of fungi, R. WEINDLING. (Clemson Agr. Col.). (*Bot. Rev., 4* (*1938*), *No. 9, pp. 475–496*).—This general critical review discusses the types of fungus associations, the morphology and physiology of fungi as affected by association, metabolic products involved in association effects, substances involved in parasitic and sex responses of Mucoraceae, accessory substances stimulating growth or sporulation, the influence of variations in food supply and environal conditions on association effects, and methods used in the study of association phenomena. The general conclusion appears to be that each case of association must be treated as a problem by itself, the specific organisms involved determining the mechanism of the interaction together with external factors. Association types, such as symbiosis or antagonism, may be considered as due to a balance of numerous effects appearing beneficial or injurious to the observer. In view of the intricate systems existing in the relatively simple associations in artificial cultures, special caution is advocated in the interpretation of the far more complex natural populations where so many uncontrolled or uncontrollable factors are involved. The author lists 81 references.

Cryptogamic botany.—I, Algae and fungi; II, Bryophytes and pteridophytes, G. M. SMITH (*New York and London: McGraw-Hill Book Co., 1938, vols. 1, pp. VIII+545, figs. 299; 2, pp. VII+380, figs. 224*).—This text was designed for students having had an introductory botanical course and wishing a more detailed study of groups below the seed-plant level. It is written with the viewpoint that a thorough knowledge of a representative series in each of the major groups is better than scraps of information about a large number. Wherever possible the genera selected occur in the United States and are widely distributed. The bibliographies presented at the ends of the individual chapters are provided as indicating sources where students may find fuller discussions of the various subjects rather than as documentations of the author's statements. The subject indexes to the two volumes cover about 35 pages.

Additions to the Uredinales of Venezuela, F. D. KERN. (Pa. State Col.). (*Mycologia, 30 (1938), No. 5, pp. 537–552*).—Includes species of *Aecidium, Chrysocyclus, Maravalia, Phakopsora, Prospodium* (1 n. sp.), *Puccinia* (1 n. nom., 2 n. spp.), *Uredo* (1 n. sp.), and *Uromyces*.

Additions to the literature of mycorrhizae, A. P. KELLEY (*Landenberg, Pa.: Landenberg Lab., [1937], pp. 19*).—This supplements the annotated bibliography previously noted (E. S. R., 77, p. 31)

A comparative study of the origin and the cytological development of some legume nodules, F. W. BIEBERDORF (*Minn. Acad. Sci. Proc., 4 (1936), pp. 51–55*).—The results of a histological and cytological study of nodule development are briefly presented for soybean, cowpea, sweetclover, alfalfa, vetch, and peanut plants grown in washed sand, Knop's solution, and sand and loam soil mixed.

Cell inclusions and the life cycle of rhizobia, I. M. LEWIS (*Jour. Bact., 35 (1938), No. 6, pp. 573–586, pl. 1*).—The cells of *Rhizobium* spp. were found to deposit fat bodies not stained by anilin dyes, while the barred or banded condition of the stained cells was due to stained areas of cytoplasm alternating with these fat bodies. The latter are considered lifeless cell inclusions. The morphological and cytological changes occurring when cells are transferred from old cultures to fresh media correlated with phases of growth, which are cyclic. The term growth cycle is, therefore, appropriate to designate the series of repetitive changes, but the life history is not cyclogenic in the sense that special reproductive cells are formed in the process of reproduction.

A bibliography of about three pages is included.

Synthesis of growth factors by Rhizobium trifolii, P. M. WEST and P. W. WILSON. (Univ. Wis.). (*Nature [London], 142 (1938), No. 3591, pp. 397, 398*).—A study of the growth factor requirements of *R. trifolii* indicated that under suitable conditions it is able to synthesize all the organic substances essential for growth from a synthetic carbohydrate-mineral salts medium of known composition. From various chemical and biological properties, two components of the *Rhizobium* factor were identified as thiamin and riboflavin, which occurred in the culture autolysates as heat-labile complexes. The organism was found to synthesize 19.6 μg of thiamin per gram, an amount close to that found in yeasts.

The utilization of CO_2 by the propionic acid bacteria, H. G. WOOD and C. H. WERKMAN. (Iowa Expt. Sta.). (*Biochem. Jour., 32 (1938), No. 7, pp. 1262–1271, figs. 2*).—The C of the CO_2 utilized by *Propionibacterium* spp. was found in the propionic, succinic, and acetic acids and propyl alcohol produced. Total carbon determinations before and after fermentation indicated an increase in the total organic C of the medium equivalent to the decrease in the inorganic C of the CO_2. The uptake of gaseous CO_2 was sufficient to create a partial vacuum in the apparatus used. The succinic acid formed and the CO_2 utilized were approximately equimolecular, and it is suggested that production of the former is by synthesis from a 3–C compound through addition of CO_2. In the absence of CO_2 little or no succinic acid was formed. The relative proportions of the products varied with time and the CO_2 utilized. The succinic acid formed increased while the propionic acid decreased. Utilization of CO_2 by heterotrophic bacteria is considered in connection with other reactions proposed for the formation of succinic and citric acids.

Studies on the fermentation of tobacco.—II, Microorganisms isolated from cigar-leaf tobacco, J. J. REID, D. W. MCKINSTRY, and D. E. HALEY (*Pennsylvania Sta. Bul. 363 (1938), pp. [2]+18, figs. 9*).—Continuing these studies (E. S. R., 79, p. 208), micro-organisms of cured and fermenting cigar-leaf tobacco, representative of the cigar filler and binder types produced in Pennsylvania, Wisconsin, and Ohio and found in significant numbers, were isolated and studied in pure culture. Satisfactory fermentation was associated with a rapid increase of bacteria of the *Micrococcus candicans* type and the *Bacillus subtilis-mesentericus-vulgatus* group. The *B. megatherium* group and the genera *Penicillium* and *Aspergillus* predominated on the cured leaf, but apparently played little if any part in a satisfactory fermentation, viable fungi disappearing entirely in the early stages and bacteria of the *B. megatherium* group failing to show significant increase during fermentation. Cocci multiplying on cigar-leaf tobacco ranged from grapelike clusters of small spherical cells in early, to large, oval-celled forms in later stages. Many resembled *M. candicans* in cultural characteristics, but this type was preceded by a somewhat more physiologically active type and followed by a less active form. Cultural characteristics of the *B. subtilis-mesentericus-vulgatus* group reproducing on fermenting tobacco allowed division into three types numerous during the more active fermentation stages and a fourth usually found in the final stages which may represent physiological changes induced in one or more of the three other types. One type may be a variant of *B. subtilis* and the others variants of *B. mesentericus* or *B. vulgatus*. *Clostridium* spp. are present on cured tobacco, which, with insufficient oxygen, may multiply rapidly, seriously affecting the quality of the finished leaf. Species of this genus on fermenting tobacco include cellulose-decomposing types capable of reproduction at 55° C., and they may be responsible for rotting during the fermentation. Gram-negative bacteria and non-spore-forming rods were not found reproducing in a satisfactory fermentation of cigar-leaf tobacco.

The lipids of Bacterium tumefaciens, E. Chargaff and M. Levine (*Jour. Biol. Chem., 124 (1938), No. 1, pp. 195–205*).—The authors report the isolation of fat, phosphatide, and polysaccharides. The fat fraction consisted of glycerol, sterols, palmitic and oleic acids, a new saturated liquid acid, and a complex mixture of higher unsaturated fatty acids.

A field key to the more common non-woody vascular plants of central and northern Minnesota, J. B. Moyle (*Minneapolis: Burgess Pub. Co., 1938, pp. [2]+63, [figs. 6]*).—This set of keys to the terrestrial and aquatic herbaceous plants of the area is based on characters that are present throughout the growing season, and includes the horsetails, club mosses and ground pines, and ferns, as well as the flowering plants. Check lists alphabetized by Latin names and including common names and families, illustrations of plant parts, charts showing the leaf characters of monocots and dicots, and a glossary are provided.

Atmospheric pollen survey of Charlottesville, Virginia, for 1936, E. C. Cocke (*Jour. Elisha Mitchell Sci. Soc., 54 (1938), No. 1, pp. 143–153, fig. 1*).—This includes lists of the native trees, common grasses, and wind-pollinated weeds of Albemarle County, and tabulations of the results of the pollen concentration in number of grains of the different species per cubic yard from March 1 through October.

Salt spray: An important factor in coastal ecology, B. W. Wells and I. V. Shunk. (Univ. N. C.) (*Bul. Torrey Bot. Club, 65 (1938), No. 7, pp. 485–492, figs. 3*).—Spring observations (1937) indicated that the repressed sloping forms of seaside shrubs ("wind forms") are not due to the wind, but rather to the killing action of salt spray on the young shoots. They should therefore be called "spray forms." Based on the death within a month of *Aristida stricta* transplanted from an inland stand to the front dunes, it is suggested that dominance in the ocean dune community is due to salt spray resistance.

Nitrogen and sulphur content of leaves of plants within and at different distances from industrial centers, M. M. McCool and A. N. Johnson (*Contrib. Boyce Thompson Inst., 9 (1938), No. 4, pp. 371–380*).—It is concluded from these studies that the SO_2 from smoke-producing areas did not adversely affect the vegetation in the Camden, N. J., East St. Louis, Ill., and St. Louis, Mo., areas. "With few exceptions, the total sulfur and sulfate sulfur contents of the leaves of the plants collected did not decrease significantly with distance from the sources of SO_2. Although comparatively few of the individual regression coefficients differed significantly from zero, the fact that 30 out of 34 with regard to total sulfur and 27 out of 29 with regard to sulfate sulfur were negative in sign makes it quite clear that, on the whole, there is a significant decrease in sulfur content of the plants with increase in distance from the sources of sulfur dioxide."

Effects of ultraviolet radiation upon germination and seedling development, H. W. Popp and F. B. Charlton (*Pennsylvania Sta. Bul. 366 (1938), pp. [2]+50, figs. 17*).—Long exposures (over 2 hr.) to the unscreened mercury vapor arc had no effect on dry seeds but reduced the rate and final germination of soaked seeds. Also at 2 min. or less, or at any length exposure through the screens tried, there was no effect on germination of the seeds studied, including white mustard, buckwheat, radish, turnip, cucumber, pigweed, and curled dock. Exposures of 15 min. or more per day at 50 cm. from the unscreened arc proved destructive to seedlings after one or more treatments and were fatal if continued for 10 days. This destructive action was restricted to the region below 300 mμ. Exposures of 2 min. at 50 cm. were less injurious but had a marked formative effect on the seedlings, and the epidermal tissues were injured though the plants were not killed. Plants in the dark were more markedly affected than in the light. Still shorter exposures caused reduced stature but not to so marked a degree. Seedlings exposed 2–4 min. per day were lower in fresh and dry weights and in percentage of moisture than controls, and were lower in total carbohydrates and reducing sugars but somewhat higher in starch. No significant difference was noted between irradiated plants and controls when seedlings were exposed at the same distance at which the unscreened arc was used and for the same time, or under the same total intensity of radiation to the ultraviolet region between 300 and 400 mμ, to this region in combination with infrared radiation or to the latter alone. No significantly greater elongation of seedlings was obtained either by extremely short irradiation with the unscreened arc or by short irradiations with any other region of the ultraviolet studied than occurred in nonirradiated controls. With longer irradiation the long-wavelength ultraviolet region tended to stunt the plants. In general, both the destructive action and the formative effects on stature and general development decreased with increasing distance from the lamp and with decreased time of exposure. The most notable effect of the ultraviolet region of the spectrum was to reduce the stature of the plants, and this effect increased with decreased wavelength, with increased length of exposure, and with increased intensity.

Inducing "dormancy" in potato tubers with potassium naphthaleneacetate and breaking it with ethylene chlorohydrin, J. D. Guthrie (*Science, 88 (1938), No. 2273, p. 86*).—Potato seed pieces treated with ethylene chlorohydrin after treatment with potassium naphthaleneacetate (inhibitory to bud growth in nondormant tubers) were stimulated to grow much before similar pieces not treated with the ethylene compound.

Phosphatase activity of the juice of plant tissue following treatment with ethylene chlorohydrin, J. D. Guthrie (*Contrib. Boyce Thompson Inst., 9 (1938), No. 4, pp. 293–297*).—The phosphatase activity of the juice of whole, recently harvested potato tubers treated with ethylene chlorohydrin was lower than that of controls, due to the presence of an inhibitory substance in the treated juice removable by dialysis. Small increases in phosphatase activity of the juice of gladiolus corms and Jerusalem-artichoke tubers occurred after ethylene chlorohydrin treatment.

Root and shoot production induced in cabbage by beta (3) indoleacetic acid, E. Goldberg (*Science, 87 (1938), No. 2266, pp. 511, 512*).—In the cabbage the chemical treatment applied apparently merely induced the internal conditions requisite for expression of a capacity rarely coming to expression normally in this plant.

Ascorbic acid and the growth of plant embryos, J. and D. Bonner (*Natl. Acad. Sci. Proc., 24 (1938), No. 2, pp. 70–75, figs. 2*).—Continuing previous studies (E. S. R., 78, p. 601), the point particularly emphasized in the results here reported is that a plant will or will not respond to a given accessory growth factor, this depending, among other things, on (1) the need for the factor in question, and (2) the ability to synthesize it—principles long recognized in animal physiology. It is shown that plants as closely related as different varieties of peas differ greatly in their responses to ascorbic acid. In reality they differ in their ascorbic acid autotrophism.

Embryology of Pisum sativum, D. C. Cooper. (Wis. Expt. Sta.). (*Bot. Gaz., 100 (1938), No. 1, pp. 123–132, figs. 31*).—Pollination occurs 24–36 hr. before the open flower stage, and fertilization has already taken place and division of the zygote is under way by the time the flower is fully opened. The development of the embryo is followed in detail, culminating in the mature seed in which the cotyledons act as storage organs, the endosperm having been completely assimilated during the course of embryo development.

Anatomy of auxin treated etiolated seedlings of Pisum sativum, F. M. Scott. (Univ. Calif.). (*Bot. Gaz., 100 (1938), No. 1, pp. 167–185, figs. 29*).—Three series of etiolated pea seedlings were grown, decapitated in the third internode, treated with auxin paste or aqueous solution, collected at 8-hr. intervals, and observed for 164 hr. The general results of auxin treatment, swelling and root formation, varied in extent in relation to seedling age and auxin concentration, and the form of the swelling varied in reference to the concentration. Four phases of growth were recognized during the formation of a swelling and are described. The root primordia varied in origin from younger to older stems. In the former the identity of the endodermis was lost in the meristem cylinder complex, and the root primordia were traceable to a group of ray cells within this complex. In the older seedlings the endodermal cells did not divide, and the primordia were therefore pericyclic and intra-pericyclic in origin. The endodermis was traceable as a primordial sheath. The roots arose approximately in whorls at successive levels on the stem, but no visible anatomical differentiation to account for this distribution was found.

A cytological study of colchicine effects in the induction of polyploidy in plants, O. J. Eigsti (*Natl. Acad. Sci. Proc., 24 (1938), No. 2, pp. 56–63, figs. 36*).—The exact role played by colchicine is said to lie essentially in the inhibition of the mitotic spindle which prevents separation of the daughter nuclei, and cell plate formation, with the subsequent division into two cells. There is a high degree of specificity for inhibition of certain phases of cell division and the apparent promotion of other phases of the mitotic process.

Colchicine stimulation of yeast growth fails to reveal mitosis, O. W. Richards (*Jour. Bact., 36 (1938), No. 2, pp. 187–195, figs. 2*).—This technic applied to the growth of *Saccharomyces cerevisiae* failed to show evidence of other than amitotic cell division. The stimulation was not of the kind given by bios but was due rather to the colchicine serving as a food and as a buffer in lessening adverse effects of the increasingly unfavorable medium.

Tropic responses of leafy plants induced by application of growth substances, P. W. Zimmerman and A. E. Hitchcock (*Contrib. Boyce Thompson Inst., 9 (1938), No. 4, pp. 299–328, figs. 7*).—Induced tropisms were found to be conditioned by the relative positions of the organs to gravity. Regardless of whether the substances used (naphthaleneacetic, indoleacetic, and indolebutyric acids) were applied to the roots (in soil) of intact plants, to the tops of plants with excised tips, or to the basal end of excised shoots, the final results were similar. Some evidence was noted that growth substances were unequally distributed through tissues of shoots placed horizontally. Low concentrations accelerated negative geotropic responses, while high concentrations induced positive geotropism. Plants kept in darkness for several days lost the capacity to right themselves when placed horizontally, but regained this power when treated distally with growth substances. Applied to the soil or to the basal end of excised shoots, the growth substance moved upward, inducing responses at the tip. When the upper end of a shoot with excised tip was treated the substance moved downward, inducing characteristic responses along the way. Applied epidermally near the middle of an intact plant, responses were induced in both directions. Applied epidermally, the substances apparently were translocated in the cortical tissue. Treated shoots grew more than the controls, regardless of their relative position with reference to gravity. Growth occurred on the upper and lower sides of geotropically stimulated stems (horizontal), but the convex side elongated most. Horizontal shoots treated with medium concentrations continued to grow horizontally, and the total growth (sum of the two sides) was greater than that of controls exhibiting negative geotropism. Epinasty of leaves was induced without chemical treatment by placing the plants horizontally for 24 hr. and then returning them to their original position. Epinasty occurred in all but 2–3 young leaves as the stems grew back towards the vertical position, indicating a redistribution or increased production of natural growth substance or both. The plants finally appeared like those growing in soil to which synthetic substances had been applied.

Tomato, sunflower, cosmos, marigold, and tobacco were used in the course of these studies, and the results were similar in all species.

Researches on the culture of plant tissues: Culture trials with meristematic tissues, R. J. Gautheret (*Recherches sur la culture des tissus végétaux: Essais de culture de quelques tissus méristématiques. Paris: Libr. E. Le François, 1935, pp. 279, pls. 19, figs.* [93]).—The subject matter of this monograph (with a nine-page bibliography) is discussed under the sterilization of seeds, growth of roots at and immediately after isolation, culture of isolated roots, culture of root meristems, survival of isolated cells of the root cap, and culture of cambial tissue.

Technic in the study of vascular systems in plants, F. A. Varrelman (*Stain Technol., 13 (1938), No. 3, pp. 115–119, figs. 2*).—Methods were devised for studying the morphology of rosaceous fruits, one being to dissect the buds and immerse over night in 20 percent HCl, then in 5 percent NaOCl until bleached. After dehydrating, clearing, and mounting in cedar oil. they are examined by darkfield or intense reflected light. Another method is to place the living stems (bearing buds) in a 0.01 percent aqueous solution of Niagara sky blue, forcing infiltration by pressure obtained in a pressure cooker with a bicycle pump. The buds are then dehydrated and embedded by ordinary procedures. A series of photographs may be taken of the cut surfaces of such a stained bud, after each section has been removed from the block.

The development of vascular tissues and the initiation of the inflorescence in Holcus sorghum, C. Chen (*Iowa State Col. Jour. Sci., 12 (1938), No. 2, pp. 217–225, figs. 9*).—The variety Kaoliang was used in this study, detailed results of which are given. Initiation of inflorescence, terminally on the axis, occurred about 5 weeks after germination.

The structure of the chloroplast, E. Weier. (Univ. Calif.) (*Bot. Rev., 4 (1938), No. 9, pp. 497–530, figs. 6*).—This analytical review (with 163 literature references) discusses the chloroplast as a vesicle, granular or optically homogeneous chloroplasts, homogeneous chloroplasts, granular chloroplasts, fibrillar structure, the presence of living crystals in the chloroplast, the submicroscopic structure of the chloroplast, origin of the starch grain and of the chloroplast, and silver nitrate reduction by chloroplasts. The most critical observations are believed to indicate that the chloroplast consists of a colorless stroma in which are embedded small disks of chlorophyll-impregnated cytoplasm, but that under certain conditions not yet well understood this structure may vary. There is probably some sort of membrane surrounding the chloroplast. Present evidence appears to indicate a protein precursor for the starch grain. Recent observations confirm the idea that the plastids have genetic continuity, existing as small granules in meristematic cells. The presence of ascorbic acid in the chloroplasts is said to have been demonstrated.

The leaf and stem anatomy of Cornus florida in relation to light exposure, C. K. Shank (*Amer. Midland Nat., 19 (1938), No. 2, pp. 417–426, figs. 10*).—*C. florida* in an open meadow had a rounder, fuller crown, due to profuse branching and shortened internodes, than in its ordinary habitat. The foliar anatomy of trees in the open carried on the difference in that the leaves were thicker and somewhat smaller than those from the woods. Climatological factors accounted for differences in leaves from one year to the next in that the drier, hotter season is interpreted as making possible greater variation from one side of the tree to the other. The annual increment of twigs from the woods was more in length and less in diameter than for trees in the open—the difference apparently largely a matter of cell length. The habitat differences from woods to open were sufficient to produce the differences noted in leaves and twigs, and although variation occurs in the size and thickness of the leaves on trees in the open, it is more marked in drier seasons so that differentiation between the leaves from the north and south sides is distinct.

Studies in drought resistance of the soy bean, H. F. Clements (*Wash. State Col., Res. Studies, 5 (1937), No. 1, pp. 1–16, figs. 5*).—The capacity of soybean plants to resist drought in the field was studied, the growth rates observed under conditions of normal and of greatly reduced rainfall, respectively, together with a correlation of their chemical composition under the two conditions serving as the basis. Growth was reduced under drought conditions, although in other respects the plants were similar in outward appearances. The hemicellulose content of the drought-resistant plants was much higher than that of plants grown under more optimum conditions. The soluble sugars appeared to show no response to drought. Starch was more abundant under the unfavorable growth conditions, believed to be an indication that although the drought did not seem to reduce photosynthesis it did slow up the translocation of materials. Nitrogen metabolism was maintained at a higher level during drought than during normal conditions, even though growth was reduced. A mechanism of drought resistance is suggested.

Studies in the drought resistance of the sunflower and the potato, H. F. Clements (*Wash. State Col., Res. Studies, 5 (1937), No. 2, pp. 81–98, figs. 8*).—Though the growth of both potatoes and sunflowers was reduced under drought conditions in the field, the growth reduction in potatoes was greater than in sunflowers. Soybeans suffered less than either of them. The only marked metabolic response of sunflowers to drought was a great increase in the amount of soluble sugars in the leaves and stems. The hemicelluloses were more abundant in sunflower than in potato leaves, but were considerably less abundant than in soybean leaves. The nitrogen metabolism was maintained at high levels during drought. Sunflowers met the drought by reducing the leaf area, while potatoes were without adequate means of resisting drought and died prematurely. The possible significance of the high nitrogen metabolism, the large amounts of simple sugars in sunflowers, and the hemicelluloses in soybeans is discussed.

Mechanisms of freezing resistance in the needles of Pinus ponderosa and Pseudotsuga mucronata, H. F. Clements (*Wash. State Col., Res. Studies, 6 (1938), No. 1, pp. 3–45, figs. 29*).—The moisture content of the needles was found to vary according to the season, the highest levels being in midwinter and the lowest when the needles were changing from winter to spring conditions. The youngest needles always had the highest moisture content, and the old the lowest. In general, pine needles had higher levels than Douglas fir. These results correlated rather well but inversely with low-temperature resistance. In completely developed needles the total nitrogen (mostly insoluble) based on residual dry weight showed no essential variations in relation to season or age, and there seemed to be no marked variations in the soluble nitrogen fractions which could be correlated with winter temperatures. However, the carbohydrates showed striking variations and correlations with both age and season The soluble sugars were at maxima during the coldest part of winter, and a second accumulation was correlated with rapid synthesis in spring and early summer. The highest concentrations were found in the oldest needles, and the fir needles contained considerably more than the pine. The sugars apparently play a major role in low-temperature resistance. Starch was very abundant during rapid synthesis but otherwise was present in very small amounts. The more permanent acid-hydrolyzable materials seemed also to be involved in the resistance mechanism. Fatty materials showed a strong correlation with winter temperatures. The roles which may be played by these various materials are fully discussed, with special reference to the mechanism of freezing resistance.

The longevity of plants, H. Molisch, trans. by E. H. Fulling (*Die Lebensdauer der Pflanze. New York: E. H. Fulling, 1938, pp. [1]+226, figs. 38*).—In this monograph the author has undertaken to present a study of the longevity of plants from various viewpoints and to gather the known facts, with necessary revisions, as it concerns the entire plant kingdom. The subject matter is discussed under the longevity of unicellular and multicellular organisms, longevity and related phenomena, the means of prolonging the life of plants, rejuvenescence, apparent death, and old age, death, and the alleged potential perpetual life of the tree. The bibliography covers about 21 pages, and subject and author indexes are provided.

Cell necrobiosis and protoplasmic death, W. W. Lepeschkin (*Zell-Nekrobiose und Protoplasma-Tod. Berlin: Borntraeger Bros., 1937, pp. IX+198, figs. 10*).—The subject matter of this monograph (with a 38-page bibliography) is discussed under morphological changes, cytological processes, and physical and chemical changes in cell necrobiosis, the setting free of energy in cell necrobiosis, theoretical considerations, and special cases of cell necrobiosis and protoplasmic death. Both plants (including bacteria) and animals are discussed.

A rapid method for determining the viability of dormant seeds, F. Flemion (*Contrib. Boyce Thompson Inst., 9 (1938), No. 4, pp. 339–351, pl. 1*).—Tests with various types of dormant seeds indicated that their viability can be determined in 5–10 days by observing the behavior of excised embryos on moist filter paper in Petri dishes at 21°–23° C. Nonviable seeds deteriorated under these conditions, while viable embroyos exhibited various types of development. The results with this method agreed well with actual germination tests. A bibliography of 70 titles is included.

GENETICS

The fusion of broken ends of sister half-chromatids following chromatid breakage at meiotic anaphases, B. McClintock (*Missouri Sta. Res. Bul. 290* (*1938*), *pp. 48, figs. 30*).—A chromatid broken at either meiotic mitosis in corn, according to the observations reported, will show a bridge configuration when the two split halves of this chromatid attempt to separate in the following mitosis, i. e., in the first nuclear division in the microspore. Indications were that the bridge is produced through a union of the two split halves of the chromatid at the position of previous breakage. The method of producing breaks in chromosomes included the use of an inversion in the long arm of chromosome-4 in corn. The method for relating the spores with a single chromosome involved in a bridge configuration to those which contain a chromosome broken at the meiotic mitoses, and two processes which result in the inclusion within a telophase nucleus of a chromosome which has no spindle fiber attachment region are described.

The nature of the interaction of genes affecting four quantitative characters in a cross between Hordeum deficiens and Hordeum vulgare, L. Powers. (U. S. D. A. and Minn. Expt. Sta.). (*Genetics, 21* (*1936*), *No. 4, pp. 398–420; abs. in Minnesota Sta. Rpt. 1937, pp. 15, 16*).—The effect of genes associated with color of glumes, type of spike and habit of growth upon yield of seed and number of spikes per plant, plant height, and awn length were studied in F_1–F_3 of a cross between B 1, a standard barley (E. S. R., 66, p. 126) with black glumes and deficiens spike, and brachytic barley with white glumes, vulgare spike, and brachytic growth. The genes favorable to high weight of seed per plant usually gave as great as or greater differences over their alleles in combination with genes for higher yield than with genes for lower yield. Similar general behavior was noted for genes affecting number of spikes per plant, plant height, and awn length. Genic variability not associated with any of the three chromosome groups identified by genes with qualitative effects gave a greater increased weight of seed per plant in combination with *VVBrBr* than with *vvbrbr*. It was found that genotypes affecting the same character may have different variances even though their means may be similar, and that under good environment favorable genes would produce higher increases in yield over unfavorable genes than with poorer environment.

The production of a new physiologic race of Sphacelotheca sorghi, S. Vaheeduddin. (Minn. Expt. Sta.). (*Phytopathology, 28* (*1938*), *No. 9, pp. 656–659, fig. 1*).—From crossing haploid biotypes obtained from chlamydospores of a single smut ball, a physiologic race (race 6) was produced differing from any hitherto described. While it has not been found in nature, the results furnish evidence that new races can arise from crosses between biotypes within a species.

Inheritance of resistance to tobacco-mosaic disease in tobacco, F. O. Holmes (*Phytopathology, 28* (*1938*), *No. 8, pp. 553–561, fig. 1*).—A dominant gene, *N*, inducing a necrotic response to tobacco-mosaic virus, was transferred from *Nicotiana glutinosa* through the medium of the amphidiploid species *N. digluta* into strains of *N. tabacum*. By repeated backcrosses of necrotic-type hybrids to *N. tabacum*, tobacco-like derivatives of necrotic type were produced.

A homozygous line was then attained by repeated selfings which is self-fertile and fertile with other tobacco strains. The introduced gene is regularly distributed to its gametes, and so to all its progeny, whether obtained by selfing or hybridization. It is anticipated that it may prove feasible to incorporate this gene in locally acceptable types of tobacco, to prevent spread of virus from plant to plant within the tobacco crop, and so to eliminate the virus reservoir in tobacco and tobacco products, the usual sources of infection both for succeeding crops of tobacco and for other susceptible crops.

Breeding for resistance to fire blight in pears, S. L. Hsiong (*Farm Res.* [*New York State Sta.*], *4* (*1938*), *No. 4, pp. 2, 8, fig. 1*).—This study comprised a total of 11 Kieffer hybrids involving 359 seedlings. The degree of resistance shown by each variety or cross was noted relative to the number of shoots infected and to the total length of the lesions, an index of susceptibility being obtained by multiplying the percentage infected by the average length of lesion. The results obtained led to the conclusion that crossing a susceptible with a resistant variety such as Kieffer would increase the resistance in the next generation. The cross Kieffer × Phelps proved to be the most resistant of those made, the other 10 crosses being listed in the order of their resistance, with Pulteney × Kieffer the most susceptible. The data indicated that the most resistant crosses were not produced by crossing two resistant varieties, but by crossing Kieffer with a susceptible variety, that resistance to fire blight is apparently due to a dominant or partially dominant factor or factors, and that greater resistance is obtained if the more resistant parent is used as the mother.

The maternal effects on growth and conformation in Shire horse-Shetland pony crosses, A. Walton and J. Hammond (*Roy. Soc.* [*London*], *Proc., Ser. B, 125* (*1938*), *No. 840, pp. 311–335, pls. 2, figs. 10*).—In studies at the Animal Research Station, Cambridge, England, three foals produced by crossing a Shire stallion with Shetland mares were not significantly different in weight from pure Shetland foals. Two foals produced in the reciprocal cross were smaller than Shires, but the differences were not significant. The weights of all foals were about 8 percent of the weights of their dams. A comparison of the growth of three females of the different types of breeding showed that the cross-bred filly from the Shire dam grew especially rapidly until weaning at about 4 mo., after which there was a distinct drop in growth rate. The cross-bred did not grow nearly as rapidly as the purebred Shire, and the weight attained at 3 yr. was intermediate between average Shetland and Shire weights but greater than the weight of the cross-bred from the Shetland dam. The cross-bred from the Shetland dam grew only a little more rapidly than a pure Shetland filly, but after weaning the cross-bred filly from the Shetland dam grew much more rapidly than pure Shetlands. The difference between the two types of cross-breds was still very marked at 3 yr. of age. The differences in ratios between the measurements of body parts in cross-breds were not great.

The maternal effects are suggested as due to (1) the maternal regulation of fetal nutrition, (2) maternal hormonal control, or (3) cytoplasmic inheritance. The interplay of genetic and nutritional factors in growth and development are considered.

Aids to the identification of monozygotic twins in cattle, G. Bonnier and S. Skarman (*Jour. Heredity, 29* (*1938*), *No. 7, pp. 269–272, figs. 2*).—Comparative cross sections of the hair have proved especially useful in differentiating dizygotic and monozygotic twins in cattle at the Swedish Animal Breeding Institute, where comparative feeding and management tests are run on like and unlike twins.

Hydrocephalus in swine: A new lethal defect, C. T. Blunn and E. H. Hughes. (Univ. Calif.). (*Jour. Heredity, 29 (1938), No. 5, pp. 203–208, figs. 3*).—A lethal factor causing hydrocephalus, light coat color, and short tail appeared in the progeny of one Duroc-Jersey boar when mated with some of his daughters and of his son mated to his dam and his daughters. In the litters in which hydrocephalous pigs appeared, there were 136 normal and 22 male and 20 female hydrocephalous pigs. The condition seemed to be controlled by a single recessive gene designated as *h*. There was no evidence of sex linkage. Three color variations suggested the possibility that the syndrome was due to closely linked genes instead of three effects from one gene.

The inheritance of "high uric acid excretion" in dogs, H. C. Trimble and C. E. Keeler (*Jour. Heredity, 29 (1938), No. 8, pp. 280–289, figs. 4*).—A study of the inheritance of high uric acid excretion in the urine, as found in Dalmatian dogs, showed that this condition was inherited as a simple recessive autosomal gene not linked with the gene complex for harlequin spotting found in Dalmation coach hounds. The studies were based on the cross of a Collie with a Dalmatian and subsequent F_1, F_2, F_3, and backcrosses of the progeny.

Hairless Siamese cats, E. Letard (*Jour. Heredity, 29 (1938), No. 5, pp. 173–175, figs. 2*).—A pair of normal Siamese cats produced a few hairless cats which on mating with normals produced only normals. Inter se matings of hairless individuals produced only hairless animals. The condition thus proved to be a simple recessive.

Studies on size inheritance in mice, L. W. Law (*Genetics, 23 (1938), No. 5, pp. 399–422, figs. 3*).—In a further study of the relation of size to certain known genes (E. S. R., 76, p. 463), analyses were made of the segregation in backcross progeny from several inbred strains of genes for body weight, body length, and tail length with the genes for pink eye (*p*), short ear (*se*), dilution (*d*), brown (*b*), nonagouti (*a*), piebald (*s*), waltzing (*v*), extreme dilution (c^h), and their allels. Consideration was also given to the relation between known genes and tail ring number, number of caudal vertebrae, and length of the fifteenth vertebra in some backcrosses. Brown backcross mice were regularly larger than their black sibs. Results from a backcross in which the brown gene was contributed by the smaller parent suggested that the brown gene itself, rather than a closely linked gene, influenced general body growth. Although the numbers were too small to give significant results, it appeared that the short ear gene was more influential in reducing size than the brown gene was in stimulating growth. The piebald and waltzing genes seemed to be linked to the genes for small body size. The dilution gene seemed to be associated with a higher tail ring number and a higher caudal vertebra number than its allel *D*. No support was found for the hypothesis of Fortuyn (E. S. R., 67, p. 377) that tail ring number behaved as though determined by a single pair of autosomal genes or for the presence of influencing genes in the *Y* chromosome.

Coat color in the meadow-vole: Inheritance of cream coat-color in Microtus pennsylvanicus, with descriptions of several other color variations, F. H. Clark (*Jour. Heredity, 29 (1938), No. 7, pp. 265, 266, fig. 1*).—The appearance of five cream color variations among vole caught in Michigan is described. One cream mutation was found in breeding tests to be recessive to normal. F_1 matings produced 51 normal and 12 cream progeny.

Genetic growth constants in domestic fowl, I. M. Lerner and V. S. Asmundson. (Univ. Calif.). (*Poultry Sci., 17 (1938), No. 4, pp. 286–294*).—Computation of growth constants for cross-bred fowls from Warren (E. S. R., 64, p. 820) and others, gave evidence of the action of sex-linked growth factors in the

Rhode Island Red × Leghorn crosses. The decreasing early growth rate of late hatches led to compensatory growth later. Differences in adult weight were reflected in early growth rates.

The influence of type of sire on the body size of the progeny, W. A. and A. J. G. Maw (*U. S. Egg and Poultry Mag., 44 (1938), No. 2, pp. 78–84, figs. 7*).—Results are given on the comparative body measurements and size of the progeny of three Barred Plymouth Rock roosters—one short-bodied and early maturing, one of average type, and one rangy and upstanding. The preliminary analysis showed that the extreme types influenced the type of progeny. The medium and more compact males sired birds with greater percentages of flesh, whereas the progeny of the rangy sire were rangier, having lower percentages of flesh.

The sex ratio of the domestic fowl and its bearing upon the sex-linked lethal theory of differential mortality, F. A. E. Crew (*Roy. Soc. Edinb. Proc., 58 (1937–38), No. 1, pp. 73–79*).—Males constituted 50.34 percent of the 515,976 chicks alive at hatching and 51.03 percent of 8,565 embryos dying in the shell. Among 2,216,051 chicks hatched in a commercial hatchery, there were 51.38 percent males. Variations in the sex ratio were found to be related to the type of breeding and strains from which the eggs were obtained. It is considered that these results do not lend support to the theory that sex-linked lethals cause greater mortality in the females than in males. Characteristic differences in the sex ratios of the chicks hatched were observed in the different strains.

On the inheritance of pendulous crop in turkeys (Meleagris gallopavo), V. S. Asmundson and W. R. Hinshaw. (Univ. Calif.). (*Poultry Sci., 17 (1938), No. 4, pp. 276–285, fig. 1*).—A study of the inheritance and relation of environment to the pendulous-crop condition in Bronze and Bourbon Red turkeys showed that the condition was apparently controlled by the interaction of a pair or pairs of recessive genes with the environment. No Bourbon Reds and none of the birds even from the pendulous-crop parents developed the condition when raised at Tomales, Calif., where the mean maximum temperature was about 74° F. with high humidity and little sunshine. On the other hand, progeny from pendulous-crop birds raised at Davis, where the mean maximum temperature was 20° higher with more hours of sunshine and lower humidity, showed the pendulous-crop condition in from 50 to 100 percent of the birds. The incidence of pendulous-crop birds among the progeny of normals from pendulous-crop parents was about 25 percent. The importance of climatic conditions in the appearance of this condition is emphasized.

A skull defect in cattle, A. O. Shaw. (Idaho Expt. Sta.). (*Jour. Heredity, 29 (1938), No. 8, pp. 319, 320, figs. 2*).—Two full sisters, born dead or dying soon after birth, in the Holstein-Friesian herd had skull defects involving an opening between the frontal and parietal bones through which brain tissue protruded.

Embryonic mortality in the fowl.—VII, On the relation of malpositions to the size and shape of eggs, F. B. Hutt. (Minn. Expt. Sta.). (*Poultry Sci., 17 (1938), No. 4, pp. 345–352, fig. 1*).—Continuing this series (E. S. R., 71, p. 368), weights and measurements were recorded on all the eggs incubated during 1933 and 1934, and size and shape were correlated with the different malpositions and types. Eggs containing embryos which died after incubation did not show significant differences in weight, size, or shape from eggs which hatched. The eggs with dead embryos with the head under the left wing exceeded the controls in all dimensions and were significantly heavier and longer. The eggs with the embryos having the beak over the right wing averaged larger but were not significantly larger than eggs hatching normal embryos. The malposition involving the head under the left wing occurred in 20.14 percent of the late dead embryos in eggs over 60 g, as compared with 3.95 percent in eggs under 52 g.

The effect of certain groups of environmental factors upon the expression of broodiness, W. H. Burrows and T. C. Byerly. (U. S. D. A.). (*Poultry Sci., 17 (1938), No. 4, pp. 324–330*).—Broodiness was induced in nonbroody laying hens and young pullets by raising the temperature and placing the birds in a darkened coop with young chicks. The time required for the stimulus to be effective varied from 18 hr. to 12 days. Leghorns were less responsive than cross-bred hens. Contrary to expectation, the pituitaries of such birds were not higher in prolactin than the pituitaries of laying hens. Moderate temperatures, slow temperature changes, light, and removal of eggs inhibited the development of broodiness.

Studies on reproduction in the albino mouse.—I, The period of gestation and the time of parturition, H. Merton (*Roy. Soc. Edinb. Proc., 58 (1937–38), No. 1, pp. 80–96, figs. 4*).—From an active determination of the time of fertilization and parturition it was ascertained that parturition began in from 0.5 to 1 hr. after the birth pause, which lasted 4.67 hr. The average litter size reached a maximum in August of 8.3 and a minimum in November of 5.6. Parturition occurred in 75 percent of the cases on the nineteenth day after the vaginal plug was found.

The cytological relationship between the hypophysis and the germinal epithelium of the testis, A. J. Gatz. (Univ. Minn.). (*Anat. Rec., 70 (1938), No. 5, pp. 619–641, pls. 2, figs. 5*).—Interrelationships between the germinal epithelium and the cytology of the hypophysis are described for rats in which the germinal epithelium was more or less destroyed by X-ray castration, vasectomy, and cryptorchidism.

The experimental production of ovulation, luteinization, and cysts of the corpus luteum in adrenalectomized anestrous cats, H. B. Friedgood and M. A. Foster (*Amer. Jour. Physiol., 123 (1938), No. 1, pp. 237–242, fig. 1*).—The administration of follicle-stimulating hormone and luteinizing hormone to normal anoestrous and adrenalectomized anoestrous cats resulted in ovulation and luteinization. However, adrenalectomy delayed the process. Much larger corpus luteum cysts were formed in adrenalectomized than in normal cats whether or not cortin was administered.

Miscellaneous experiments on the estrogen-progesterone induction of heat in the spayed guinea-pig, J. L. Boling, W. C. Young, and E. W. Dempsey (*Endocrinology, 23 (1938), No. 2, pp. 182–187*).—A heat period induced in the spayed guinea pig by oestrogen injections was usually longer and less well defined as to length than periods induced by oestrogen and progesterone. Repeated heat periods occurred in animals injected with oestrogen followed by progesterone at the end of the heat period.

Quantitative studies of experimentally induced sexual receptivity in the spayed guinea-pig, V. J. Collins, J. L. Boling, E. W. Dempsey, and W. C. Young (*Endocrinology, 23 (1938), No. 2, pp. 188–196, figs. 6*).—Animals were conditioned with 50 and 200 International Units of theelin and brought into sexual receptivity with 0.2 I. U. of progesterone. The latent period and length of heat varied with the doses at intervals between the injection periods.

Effect of choline on the estrous cycle of the white rat, E. Eagle (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 3, pp. 303–305*).—Contrary to the findings of D. R. L. Duncan, T. F. Gallagher, and F. C. Koch,[2] daily subcutaneous injections of as much as 60 mg of choline chloride per 100 g body weight did not interfere with the occurrence of oestrous cycles.

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[2] Science, 85 (1937), No. 2192, p. 23.

A study of the ratio of the amount of theelin producing uterine and vaginal estrus, A. J. Szarka and G. Kurtz (*Endocrinology, 23 (1938), No. 1, pp. 64–70, fig. 1*).—Comparative studies of the doses of ketohydroxyoestrin required to produce vaginal and uterine oestrous reactions in the rat showed that from four to six times the vaginal unit were required to induce the uterine response. However, the uterine reaction was induced in about 44 to 50 hr. and completely ceased in 72 hr., when the maximal vaginal reaction was attained. Through laparotomies a simple, quick, and dependable reading of the uterine response was possible.

Partial inhibition of sex activity in the intact female rat by injected estrin, J. Ball (*Endocrinology, 23 (1938), No. 2, pp. 197–199*).—Cyclic changes in the sexual excitability of female rats were prevented by the administration of oestrin daily or on alternate days. Thus oestrin is in a sense a sex depressant.

Gonadotropic effect of androgens upon the immature rat ovary, U. J. Salmon (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 3, pp. 352, 353*).—The injection of a single dose of testosterone propionate or androstenediol to immature female rats caused opening of the vagina within 72 hr. Follicle growth and corpus luteum formation were stimulated. The action of these androgens is probably through the pituitary rather than direct since similar results were obtained with oestrogen with normal but not with hypophysectomized females.

The production of a gonadotrophic substance (prolan) by placental cells in tissue culture, G. O. Gey, G. E. Seegar, and L. M. Hellman (*Science, 88 (1938), No. 2283, pp. 306, 307*).—The supernatant liquid from human placental tissue in culture was found in Aschheim-Zondek tests to have a prolanlike action.

The effect of gonadotropic hormones on the persisting corpora lutea in hypophysectomized rats, R. O. Greep (*Endocrinology, 23 (1938), No. 2, pp. 154–163, figs. 14*).—Hypophysectomy in the rat resulted in a rapid loss of weight in the ovary during the first 5 days as a result of the rapid degeneration of the larger follicles. During the succeeding 35 days, the decline was less rapid. The ovary contained mainly persisting corpora lutea 10 days after the operation. Injection of luteinizing hormone caused complete regression of the persisting corpora lutea in from 10 to 12 days. Follicle-stimulating hormone alone produced antra-containing follicles which underwent atresia and finally formed thin-walled cysts but had no significant physiological effect on the persisting corpora lutea. The follicle-stimulating and luteinizing hormones in combination resulted in the rapid formation of large crops of follicles and oestrus, followed in succession by luteinization of follicles and dioestrus, after which absorption of the corpora lutea occurred. Marked differences were noted in the action of pregnancy urine and the luteinizing hormone on the persisting corpora lutea in the hypophysectomized female.

The effects of certain gonadal and gonadotropic hormones on the gestation period of the rat, C. A. Bunde. (Univ. Wis.). (*Endocrinology, 23 (1938), No. 3, pp. 345–352*).—Parturition was delayed in rats by treatment during the latter part of gestation with follicle-stimulating and luteinizing hormone extracts of the pituitary because of a failure of the birth mechanism. The ovaries of such animals were enlarged and heavily luteinized. Pregnant mare serum, progestin, and extracts of the corpora lutea did not inhibit parturition.

Induced postpartum lactation in hypophysectomized rats, R. I. Pencharz and W. R. Lyons. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 3, pp. 388–390, figs. 4*).—Post partum lactation was stimulated in rats hypophysectomized from 5 to 24 hr. before delivery by the twice-daily administration of sheep pituitary extract containing mammotropin and adrenocorticotropin. The young nursed but because of an insufficient milk supply died after 5 days.

Gonadotropic action of normal male urine extract on the dog, J. H. Leathem and J. A. Morrell (*Endocrinology, 23 (1938), No. 2, pp. 164–170, figs. 4*).—By daily injection, normal male urine extract was found capable of inducing all the external signs of oestrus in 11 of 12 anoestrous bitches. Ovulation occurred, and 1 bitch produced a litter of 2 normal pups.

Cytologic evidence of the gonadotropic activity of the rabbit's anterior hypophysis, H. B. Friedgood and A. B. Dawson (*Endocrinology, 22 (1938), No. 6, pp. 674–686, figs. 12*).—Cytological study of the pituitaries of breeding, nonbreeding, and immature does showed the presence of carmine-staining cells which increased as sex maturity approached and dominated the appearance of the gland of the animal after mating. The carmine cells are very prominent at the time the pituitary discharges large quantities of gonadotropic hormone within 1 to 2 hr. post coitum.

Effect of coitus on gonadotropic content of pituitary glands of pseudopregnant rabbits, A. W. Makepeace, G. L. Weinstein, and M. H. Friedman (*Endocrinology, 22 (1938), No. 6, pp. 667, 668*).—Assay of the pituitary glands of oestrous and 9-day pseudopregnant rabbits before and 24 hr. after mating showed that the gonadotropic hormone content was about 30 rabbit units in all except the mated oestrous rabbit. Ovulation in the oestrous rabbit was associated with a reduction to 5 rabbit units of hormone per gland.

Relation between the uterus and the ovaries in the pregnant hamster, M. Klein (*Roy. Soc. [London], Proc., Ser. B, 125 (1938), No. 840, pp. 348–364, pls. 7*).—Ovariectomy between the eleventh and thirteenth days of gestation in the golden hamster was found to terminate pregnancy immediately. Controls proceeded to normal term at 16 days. Such abortion following ovariectomy was not prevented by daily injections of progestin and progesterone. Abortion was prevented in seven of the animals treated with oestrone and progesterone. Removal of the pregnant uterus between the eighth and thirteenth days was followed by immediate degeneration of the corpora lutea of pregnancy. Evidently the gravid uterus produces a substance which maintains the corpora lutea of pregnancy and inhibits the ovarian cycle. If the embryos are removed but the placentae remain intact, degeneration of the corpora lutea is delayed as in pregnancy. However, persistency of the corpora lutea could not be induced by injection of either of the ovarian hormones, oestrone or progesterone.

Are the lactogenic and carbohydrate metabolism hormones identical? A. J. Bergman and C. W. Turner. (Mo. Expt. Sta.). (*Endocrinology, 23 (1938), No. 2, pp. 228–232*).—A method is described whereby extracts of the anterior pituitary were prepared, one of which contained 6,666 pigeon units per gram of lactogenic hormone and only 10 guinea-pig units per gram of the carbohydrate metabolism fraction. The other fraction contained 125 pigeon units of lactogenic hormone and 500 guinea-pig units of the hormone for carbohydrate metabolism.

Precocious masculine behavior following administration of synthetic male hormone substance, J. B. Hamilton (*Endocrinology, 23 (1938), No. 1, pp. 53–57, fig. 1*).—Injection of 500γ of testosterone propionate into chicks, beginning on the second day after hatching, induced growth in the sex organs and precocious cocklike behavior, although body growth was stunted. Crowing appeared as early as 10 days.

Relative effectiveness of testosterone-propionate and dihydroandrosterone-benzoate in the chick as indicated by comb growth, W. R. Breneman (*Endocrinology, 23 (1938), No. 1, pp. 44–52, figs. 6*).—In unoperated chicks, dihydroandrosterone benzoate was more effective in producing comb growth than testosterone propionate. The former was most effective in a single dose, whereas the latter was most effective in a series of small doses. Continued comb growth after cessation of injection was not the result of retention and slow utilization because comb growth was distinctly less in chicks caponized at 5 days than in unoperated chicks. Perhaps some other androgenic substances played a role. Development of other secondary sex characters was noted, including crowing at 11 days of age.

FIELD CROPS

Correlation between means and standard deviations in field experiments, F. R. Immer. (Minn. Expt. Sta.). (*Jour. Amer. Statis. Assoc., 32 (1937), No. 199, pp. 525–531*).—From a consideration of data from tests with varieties of small grain, it appeared that an inherent negative correlation exists generally between the mean yield of plats and the standard deviation of samples within such plats for uniformity trial data from field experiments. It appeared also that the mean yields and standard deviations of varieties or strains of crop plants tested in replicated field experiments are essentially independent, and that very little correlation can be expected between means and standard errors of different experiments conducted in different years or in different parts of Minnesota under the experimental conditions. Consequently, the standard deviation in bushels per acre as calculated from the separate tests would seem to be a more satisfactory measure of variability than the standard error expressed in percentage of the mean. Only in comparisons of the average of the means and standard deviations of three different crops would the coefficient of variability be preferred.

[Field crops research at the U. S. Field Station, Sacaton, Ariz., 1931–35], C. J. King, R. E. Beckett, and O. Parker (*U. S. Dept. Agr. Circ. 479 (1938), pp. 12, 14–29, 37–39, 44–49, 56, 58–60, figs. 9*).—The status of cotton production in Maricopa and Pinal Counties is described and brief reports are made again (E. S. R., 67, p. 28) on cotton investigations, including variety trials, strain tests with Acala, Pima v. S×P cottons, date of planting tests and ginning experiments with Pima, irrigation tests with Pima and Acala, the development of the S×P (Sakel×Pima) American-Egyptian variety and other cotton improvement work, maintenance of pure seedstocks, genetic, pollination, and fertilization studies, and variation in fiber length. Other crops work included variety tests with barley, wheat, grain sorghum, sorgo, flax, potatoes, sweetpotatoes, and lima and tepary beans; cover crops for soil improvement; breeding work with corn and sweetcorn; and crop rotations.

Handbook of experiments in agronomy. (Partly coop. U. S. D. A.). (*Ohio Sta. Spec. Circ. 53 (1938), pp. 115, pl. 1, figs. 2*).—Additional data (E. S. R., 74, p. 28) are provided on variety and cultural (including planting) tests with corn, wheat, oats, barley, soybeans, and alfalfa; variety tests with seed flax, clovers for hay, red clover, and corn hybrids v. varieties; trials of spring grains, flax, and field peas separate and in mixture, soybeans with corn and Sudan grass, meadow mixtures, and crop combinations for hay; seedbed preparations for wheat, oats, and soybeans; straw mulch for wheat; tillage experiments: cutting tests with soybeans, alfalfa, red, mammoth, white, and alsike clovers, Kentucky bluegrass, and timothy; harvesting studies with wheat, oats, corn, and soybeans; the phosphorus content of alfalfa hay; yield and composition of sweetclover roots; yield and nitrogen content of roots and tops of Korean lespedeza harvested at four dates for soil improvement; crop rotations and effects of different crop sequences; and lawn experiments, including time and rate of seeding, establishment on surface soil and subsoil, maintenance of turf grasses, intake of nitrogen by turf grasses following fertilization, observations on roots and rhizomes from Kentucky bluegrass, effects of peat as a mulch and incorporated in the soil on bent and Kentucky bluegrass, a method for watering lawns, and control of dandelion, buckhorn plantain, crabgrass, and moss in lawns. Experiments with fertilizers, soil reaction, lime, and manure (pp. 53–98) are noted on page 165.

[Field crops research in Tennessee], H. P. Ogden, L. S. Mayer, N. I. Hancock, B. D. Drain, K. L. Hertel, C. D. Sherbakoff, L. R. Neel, B. P. Hazlewood, L. A. Fister, and F. S. Chance. (Partly coop. U. S. D. A. et al.). (*Tennessee Sta. Rpt. 1937, pp. 12–18, 38, 40, 41, 42, 44, 45, 46, 47–52, 54, 55, 55–57*).—Progress results are reported again (E. S. R., 77, p. 325) from experimentation at the station and substations, including breeding work with corn, cotton, oats, wheat, barley, sweetpotatoes, soybeans, and winter peas; variety trials with corn (and comparisons of corn hybrids), cotton, wheat, oats, barley, tobacco, potatoes, sweetpotatoes, soybeans, lespedeza, and alfalfa; milling and baking tests of wheat varieties; cultural, including planting, experiments with oats, potatoes, and soybeans; fertilizer experiments with corn, cotton, and tobacco; devices and technic for measuring length and fineness, seed treatments, and growth rate studies, all with cotton; electricity as a source of heat for curing tobacco and storage and slip production of sweetpotatoes; comparison of winter cover crops on cotton; pasture experiments concerned with fertilizer treatments, spread of white clover, pasture on gravelly hill land, hay production, alfalfa on bluegrass sod, buttonbur clover, crimson clover with ryegrass, and seedings of small grains and legumes on Bermuda grass sod; and crop rotations.

Special dry-farming problems, O. R. Mathews and J. S. Cole (*U. S. Dept. Agr. Yearbook 1938, pp. 679–692*).—Certain of the problems involved in crop production discussed here include the nature of dry land soils, nitrates, erosion by wind and water, and the supply, increase, conservation, and effective use of soil moisture by water-conserving crops, cultural methods, avoiding run-off, weed control, and suitable tillage and rotation practices.

Crop rotation, C. E. Leighty (*U. S. Dept. Agr. Yearbook 1938, pp. 406–430, figs. 3*).—The relation of crop rotation to soil fertility and to control of plant diseases and weeds and erosion is pointed out. Examples of good rotations are given, and the factors important in planning rotations for a particular farm are discussed. Rotation systems adapted to the major farming regions of the United States are also outlined, with comments on actual practices and possibilities for modifications.

Distribution of sugars, root enclosed, in the soil following corn and sorghums and their effects on the succeeding wheat crop, J. P. Conrad. (Calif. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 6, pp. 475–483, fig. 1*).—Soil samples taken with a tube from beneath crop rows showed from 20 to over 200 times as much sugars as sucrose in the soil beneath the crowns of sorgo than under those of corn. In larger soil samples taken with a spade, the residual sugars expressed as sucrose were shown to occur both vertically and horizontally in highest concentrations near the plant crowns. Vertical slices to a depth of 1 ft., exceeding 100 p. p. m. of sugars, were not encountered over 6 in. from row centers, while at the sorgo row center some exceeded 4,000 p. p. m. Horizontal 1-in. layers in the row and extending 4 in. on each side of it ranged from over 12,000 p. p. m. of sugars in the first such layer to less than 10 p. p. m. in the tenth inch layer. Wheat rows parallel to the previous crop rows showed marked and significant decreases adjacent to and over the row centers of sorgo and milo, while the slight decreases adjacent to previous corn rows were not significant. See also a previous note (E. S. R., 79, p. 185).

Distribution of residual soil moisture and nitrates in relation to the border effect of corn and sorgo, J. P. Conrad. (Calif. Expt. Sta.). (*Jour. Amer. Soc. Agron., 29 (1937), No. 5, pp. 367–378, fig. 1*).—When King Philip Hybrid corn and Honey sorgo were grown in blocks of four 3.5-ft. rows 60 ft. long interspersed with fallow strips 30 ft. wide and growing conditions similar to dry farming, plants in rows bordering on uncropped areas outyielded plants in inner rows. Soil samples taken from planes perpendicular to the crop-fallow boundary lines showed definite use of soil moisture 6 ft. away laterally with sorgo and 4 ft. away with corn and definite use of nitrates 4 ft. away laterally with both crops. Under the main body of the crop, corn plants showed definite absorption of moisture from the ninth-foot depth and of nitrates from the eighth foot, while sorgo gave evidence of absorption of moisture from the twelfth and of nitrates from the tenth foot. It is thought that varietal characteristics may have affected the results.

The effect of association of rye and Austrian winter peas and of nitrate of soda on nitrogen fixation, W. B. Andrews and M. Gieger. (Miss. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 6, pp. 529–536*).—Austrian winter peas and rye grown separately and together in the greenhouse in 3-gal. pots received sodium nitrate at rates of 0, 50, 100, 200, 400, and 800 lb. per acre. Sodium nitrate in large amounts reduced the yield and nitrogen content of the peas when grown alone or with rye, whereas the yield and nitrogen content of the rye was increased in proportion to the amount of nitrate applied. The combined yield of peas and rye grown together considerably exceeded that of peas grown alone. Growth of rye with peas increased their respective average nitrogen contents from 0.94 to 1.35 and from 2.39 to 2.74 percent. Rye and pea tops each contained about the same quantity of nitrogen when grown together as when grown separately. The growth of rye with the peas increased the nitrogen fixed by an amount almost as large as the nitrogen in the rye, i. e., 0.33 and 0.37 g per pot, respectively.

Summary of effects of legumes on yields of cotton and corn in the Southern Region and nearby States (*U. S. Dept. Agr., Agr. Adjust. Admin., South. Region Agr. Conserv.. No. 3 (1937), pp.* [2]+*9*).—The information presented supplements that set forth in the two publications noted earlier (E. S. R., 76, p. 323).

Legumes in soil conservation practices, A. J. Pieters (*U. S. Dept. Agr. Leaflet 163 (1938), pp. 8, figs. 3*).—Information is given on planting certain perennial, biennial, and annual legumes variously for winter and summer cover and other uses resulting in conservation of the soil and its productivity.

The use of cover and green-manure crops, A. J. Pieters and R. McKee (*U. S. Dept. Agr. Yearbook 1938, pp. 431–444, figs. 4*).—The values of green manure crops in adding organic matter, affecting plant nutrient supplies, and improving the physical condition of the soil and of cover crops in protecting the soil in various ways are discussed, with comments on the merits of the principal legumes and grasses used for these purposes.

Quantity and relationships of certain elements in Michigan legume hays, C. E. Millar. (Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 6, pp. 507–513*).—Statistical study of effects of fertilization on plant composition and of the interrelationships of nutrient elements in alfalfa, sweetclover, and red clover hay, based on analyses of these plants accumulated during 13 yr., showed close correlation between nitrogen and phosphorous contents; positive relationships between nitrogen-potassium, potassium-phosphorus, magnesium-phosphorus, and magnesium-nitrogen contents; and inverse relationships between calcium-phosphorus, nitrogen-calcium, calcium-magnesium, and calcium-potassium contents.

Alfalfa hay grown on heavy soils contained more phosphorus than hay from light soils. Applications of superphosphate did not change the phosphorus content of field-grown alfalfa hay, tended slightly to increase it in alfalfa leaves grown on light soil, in large quantities, increased it in greenhouse-grown alfalfa hay, and increased the phosphorus content of field-grown red clover and sweetclover. Limestone reduced the phosphorus content of alfalfa. Potash tended to increase the phosphorus content of alfalfa, did not affect that of red clover, and decreased that of sweetclover. See also a note by Grizzard (E. S R., 73, p. 34).

Experiments with grass hay, F. S. Prince, T. G. Phillips, P. T. Blood, and G. P. Percival (*New Hampshire Sta. Bul. 306 (1938), pp. 24, figs. 2*).—Effects of fertilizer and cutting treatments on yields and protein contents of grass hay here reported supplement earlier studies (E. S. R., 69, p. 502).

In 3 years' tests at Greenland, 32 lb. of nitrogen from sodium nitrate increased hay yields 1,462 lb. per acre at a cost of $5.48 per ton of increase, 32 lb. each of phosphoric acid and potash from superphosphate and potassium chloride 728 lb. at a cost of $7.88, and a complete fertilizer equal to the two treatments an increase of 2,159 lb. per acre at a cost of $6.36 per ton.

On a heavy Suffield clay soil, long in hay and not generously treated with phosphorus and potash, complete fertilizers gave better returns comparatively, about from 200 to 300 percent greater increase in yield, than the nitrogen carriers. An 8–6–6 fertilizer from highly soluble materials was slightly more effective than a commercial 8–6–6 mixture. Recovery of nitrogen was increased greatly by inclusion of phosphorus and potash in fertilizers. Nitrogen alone applied about the time growth started increased slightly the protein percentage in the forage, but complete fertilizers had little effect or decreased it slightly, although both markedly increased total production of protein per acre. No fertilizer stimulated second crop yields significantly.

In another test (on Suffield clay loam), nitrogen and phosphoric acid stimulated hay production more than nitrogen and potash. Sodium nitrate applied in mid-September was about as effective as on April 15 in stimulating yields the next season, late fall and March applications of cyanamide were about equal, but complete fertilizer applied in September did not equal that put on in April. Sodium nitrate 100 lb. increased yields in greater proportion than did 200- or 400-lb. applications, and a greater percentage of the nitrogen was recovered in the hay protein.

A 1–1–1 ratio of plant fertilizer nutrients appeared more satisfactory than a 1–2–2 ratio for grass hay production, assuming that fertilizers are applied annually. Since returns from top dressing per dollar invested are small, the farmer should consider the past history of his fields and determine their fertilizer needs by a rapid soil test.

Cuttings made from June 10 to July 30 showed that more protein and a higher protein forage will be harvested from the earlier cuttings. Slightly heavier yields came from second cuttings after June 10 and June 20 harvests.

Permanent pastures: A compilation of experimental work with permanent pastures in the Southern Region and in North Carolina and Tennessee (*U. S. Dept. Agr., Agr. Adjust. Admin., South. Region Agr. Conserv., 1938, SRAC–5, pp. V+64*).—Results obtained in all permanent pasture experiments reported to date by the experiment stations in Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas are grouped as to value, establishment, improvement, and management of pastures.

Hood and supernumerary spike development in barley, O. T. Bonnett. (Ill. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *57* (*1938*), *No. 5, pp. 371–377, pls. 2, fig. 1*).—Morphological changes occurring in the development of the hood in barley were studied in the Nepal variety by dissecting spikes at successive stages of development. Photomicrographs of the principal stages were taken as in an earlier study (E. S. R., 74, p. 628). Hood primordia appear first as dome-shaped outgrowths on the adaxial side near the tip of the lemma, and the parts of the accessory flower differentiate from these primordia. The developmental sequence is similar in the accessory flower and its parts, although no lemma is formed, and the anthers and pistil usually are nonfunctional. The lemma tip of the normally placed flower develops into a hoodlike structure, and from the lateral margins two awnlike appendages develop. An awn begins to develop at the lemma tip, but is suppressed by growth of the accessory flower. Supernumerary spikes examined in Spartan, Wisconsin Pedigree No. 5, and their F_1 arose from the base of the primary spike, and probably resulted from combined effects of low temperature and a short day.

Seed setting and average seed weight as affected by two methods of opening barley flowers for emasculation, O. T. Bonnett. (Ill. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30* (*1938*), *No. 6, pp. 501–506, figs. 2*).—Barley flowers opened for emasculation for cross-pollination, cut off by slitting the lemmas, produced 21.5 percent more crossed seed and 10.8 percent heavier crossed seeds than where the tips of the lemmas and paleas were cut off just above the tips of the anthers. The average seed weights resulting from different methods of mutilating barley flowers and permitting them to self-fertilize were for normal flowers 49.13 mg; awns left on, flowering glumes slit, 41.65; and with awns removed, flowering glumes normal, 40.4, and flowering glumes clipped from 7 to 8 mm, 32.82, and from 4 to 5 mm, 20.85 mg.

The effects of variations in the yields of barley upon the amount and distribution of the residual soil moisture, J. P. Conrad. (Calif. Expt. Sta.). (*Jour. Amer. Soc. Agron., 29* (*1937*), *No. 2, pp. 145–152, fig. 1*).—Data showing differences in residual soil moisture and its vertical distribution found, at Davis, under barley plats which varied from 908 to 8,221 lb. in yield of total crop per acre, were in keeping with deductions that the larger the crop the greater is the amount of water transpired in producing it, though the absolute values of these ratios may change somewhat with varying conditions of growth. With the available moisture largely fixed and under growing conditions where the soil is not resupplied with moisture during a considerable period of growth, as the crop is larger per unit area the more deeply it will dry out the soil.

Observations on the study of varietal differences in the malting quality of barley, II, III (*Canad. Jour. Res., 16* (*1938*), *No. 6, Sect. C, pp. 234–240, 248–252, figs. 3*).—Two additional numbers are presented (E. S. R., 78, p. 186).

In part 2 of this study, by J. A. Anderson and H. R. Sallans, samples of O. A. C. 21 and Wisconsin 38 barley were germinated at 56° and 50° F. with 44.5 percent moisture and at 53° with 44.5 and 42.5 percent moisture. Aliquots were kilned and analyzed after 3, 5, 7, 9, 11, and 13 days, and data for extract, diastatic power, and permanently soluble nitrogen, as percentage of wort solids, were plotted against time. Both varieties responded about the same to changes in temperature and moisture, but values for O. A. C. 21 were consistently higher.

In part 3 by J. A. Anderson and W. O. S. Meredith, samples of 8 barleys grown at 6 widely separated points in Canada were malted in duplicate. After

6 days in the germinator, half of each sample was removed and kilned and the remainder grown 2 days longer before kilning. Changes in the relative positions of the varieties in extract, diastatic power, and permanently soluble nitrogen by the additional 2 days' growth were generally small compared with spreads between varieties and in their relative positions at different stations. The differential effect of the malting method evidently is an appreciable source of error in interpretation of results of routine malting tests, but the limiting factor in studies of comparative malting qualities of varieties is the differential effect of environment on them.

Preliminary pasture clover studies, R. E. Blaser (*Florida Sta. Bul. 325* (*1938*), *pp. 24, figs. 12*).—Winter pasture clovers best adapted to Florida, their nutritive requirements, some mineral deficiency symptoms, methods of establishment, and grazing management are discussed, with a report of preliminary results from variety, fertilizer, inoculation, and planting tests with pasture clovers and legumes in a number of localities during the 1937–38 season. Plantings from October 15 to December did better in northern Florida than earlier or later seedings. White Dutch and Ladino clovers, the highest yielders, furnished earlier grazing, were established sooner than other legumes if planted on moist soil types, and tended to be perennials and seed prolifically. Either may be planted alone or as the major part of a clover mixture, e. g., White Dutch 4 lb. and hop clover 2 lb. per acre, with another adapted clover added at a rate of from 2 to 4 lb. Essentials in establishing clover include adequate fertilization depending on soil type and previous treatment, good results coming from lime 1 ton, superphosphate 600 lb., and potassium chloride 100 lb.; manure for superior yields; thorough nodulation of roots; and soils with good winter moisture.

The effect of soil treatment in stabilizing yields of corn, L. B. Miller and F. C. Bauer. (Ill. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30* (*1938*), *No. 8, pp. 699–708, figs. 2*).—Studies of corn yield data recorded for a 15-yr. period ended 1935 from 17 soil experiment fields in Illinois showed that the fertile, dark-colored Corn Belt soils produced high yields with a high degree of regularity from year to year, while untreated land of low fertility was very irregular in corn production. Soil treatment on the poor or moderately fertile soils studied greatly improved stability of corn production except on sandy soil, where treatment raised the yield level but reduced yield fluctuation only slightly. The most successful treatments on poor and intermediate soils failed to bring either their average yield or regularity up to the level of treated plats on better soils. "Farmers who practice good farming methods will have few seasons of extreme surplus yields and are in a good position to predict the amount of their corn production." See a similar study on wheat (E. S. R., 78, p. 479).

Anatomy of the leaf and stem of Gossypium, I. E. Webber. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *57* (*1938*), *No. 4, pp. 269–286, pls. 8*).—The descriptions of leaf and stem structure of *Gossypium* presented are based on histological examinations of leaves and stems of 12 Old World species, 5 wild American, 10 cultivated or semiwild American, 2 doubtful, and 9 species belonging to related genera. More anatomical variation was observed within each of these three groups and less between the several groups than previous descriptions indicated.

Natural crossing in flax, A. C. Dillman. (U. S. D. A. and Minn. and Mont. Expt. Stas.). (*Jour. Amer. Soc. Agron., 30* (*1938*), *No. 4, pp. 279–286, figs. 4*).—Records on seven flax varieties grown 1931–33 at St. Paul, Minn., and Mandan, N. Dak., showed the average percentage of natural crossing to range from 0 to 1.88, with a maximum of 5 percent in Blanc at Mandan in 1932. The highest percentages were observed in the large-flowered Blanc and Pale Malabrigo, much less in the tubular-flowered Indian Type 68, and practically none in Bison, whose floral structures almost assure self-pollination. Flowers opened at sunrise on clear days, pollination occurred at once, and fertilization of ovules within 3 hr. afterward. Floral abnormalities precluding self-pollination provide conditions for natural crossing.

Effect of spacing on the development of the flax plant, A. C. Dillman and J. C. Brinsmade, Jr. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 4, pp. 267–278, figs. 2*).—Spacing experiments at Mandan, N. Dak., with Reserve flax in 1916 and Linota and Rio 1926–29 showed that height, size of stems, number of basal branches and bolls, and seed yield per plant were affected greatly by the space available for development. Seed yields of closely spaced plants (12 per square foot) were reduced in dry seasons. Yields per unit area differed little from spacings of 6, 4, and 3 plants but were lower in the widest (2 per square foot) spacing. The oil content of the seed and iodine number of expressed oils of each variety increased more or less uniformly from the close spacing to the 4- and 6-in. spacings, oil content being correlated with the weight of 1,000 seeds.

Effect of fertilization, cutting treatments, and irrigation on yield of forage and chemical composition of the rhizomes of Kentucky bluegrass (Poa pratensis L.), H. L. Ahlgren. (Wis. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 8, pp. 683–691, figs. 2*).—In a field study with Kentucky bluegrass (E. S. R., 76, p. 30) 1932–36, differences in yield resulting from the cutting variables, from 4 to 5 in., early heading, and fully headed to mature, were not significant except in the first year, but as the experiment progressed a definite trend in productivity favored the 4- to 5-in. level on both fertilized and unfertilized plats. Application of phosphate and potash in 1932 and nitrogen annually increased the average yield of dry matter 1,179 lb., or 72.1 percent, during the 5 yr. on plats not irrigated. In 1934 irrigated fertilized plats produced 94.1 percent more forage than irrigated unfertilized plats. Fertilized plats irrigated weekly produced 125 percent more forage than fertilized plats not irrigated. Unfertilized irrigated plats produced 43.6 percent more forage than unfertilized plats not irrigated. Moisture, fertilization, and cutting treatments were effective in order in determining the productivity of bluegrass. No significant interactions were noted between fertilizer and cutting treatments. There was a progressive decrease in yield for all fertilizer and cutting treatments due to cutting 1932–36. The carbohydrate content of the rhizomes was not reduced appreciably by fertilizer or cutting treatments used on irrigated plats in 1934.

Spineless cactus winterkills in Montana, L. C. Hurtt. (U. S. D. A. and Mont. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 4, pp. 356, 357*).—Tests of *Opuntia ellisiana*, 1934, at Miles City, Mont., showed that this spineless cactus from Texas cannot survive eastern Montana winters where temperatures down to −30° and −40° occasionally occur.

Preliminary biochemical studies on effects of certain environmental factors on development and composition of the peanut, S. L. Jodidi. (U. S. D. A. and Va. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 4, pp. 301–311*).—Analyses of lots of nuts of Small and Jumbo Virginia Runner peanuts from plats differing markedly in growth, yield, and fruit character were made to determine possible associations between environment and growth response of the plant and composition of the fruit. The two varieties showed slight differences in ash, oil, protein, crude fiber, and carbohydrate content. Ash content appeared to be decreased in kernels and shells by a high nitrogen supply of the soil (A) or by bordeaux mixture treatment (B) resulting in markedly increased plant growth and yield of pods. Total nitrogen of kernels and shells was not affected by A but was lower in B plats, while total polysaccharides and total carbohydrates were decreased on A plats and increased on B plats. Ether-extractable substances in the shells were decreased by both A and B, while sucrose content of kernels was not affected. Reducing-sugar content was extremely low in all kernels.

Growth and development of the potato as influenced especially by soil reaction, O. Smith (*[New York] Cornell Sta. Mem. 215 (1938), pp. 46, figs. 17*).—Supplementing an earlier contribution (E. S. R., 71, p. 624) with additional and more complete and comprehensive data, this memoir includes a number of features already noted from other sources (E. S. R., 78, p. 40). It is reported here that the typical sigmoid curve for rate of growth was obtained, and that respiratory activity was greatest in the early harvested, less mature tubers, and decreased gradually as maturity advanced.

Dry-matter and starch contents of tubers of representative sizes grown at various soil reactions were determined in 1932 and 1933. The dry matter percentage in tubers larger than 50 g, grown at intermediate reactions from pH 5.64 to 6.05, tended to exceed that in tubers grown at higher or lower soil reactions. Size of tubers above 1 g was not related to percentage of dry matter at any one harvest date or range of reaction. In tubers of like size, dry weight percentage appeared to be higher at from pH 7.95 to 8.27 than at from pH 4.84 to 5.34. Tubers weighing less than 50 g, in general, had lower percentages of starch on the dry-weight basis than larger tubers, which usually had the highest starch content at the last harvest. In general, the starch percentage in tubers grown at reactions from pH 5.40 to 6.05 exceeded that in tubers grown at higher or lower pH ranges. Tubers below 1 g in weight had the lowest starch percentage at all reactions and harvests.

Foliar diagnosis in relation to development and fertilizer treatment of the potato, W. Thomas and W. B. Mack. (Pa. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 6, pp. 397–414, figs. 2*).—Foliar diagnosis is defined as the composition, with respect to the dominant elements, of a leaf from a definite position (physiological age) on the stem at the moment of sampling. The nitrogen, phosphorus, and potassium content of leaves of the same physiological age, sampled periodically, from Rural Russet potato plants on plats receiving different fertilizer treatments were studied in relation to the nature of these treatments and to plant development.

Addition of each dominant nutrient element to the soil increased the content of that element in the leaves sampled. Utilization of any nutrient, however, was profoundly influenced by the presence in the fertilizer of other nutrients, as illustrated by accumulation of potassium in leaves from plats receiving potash fertilizer but with insufficient nitrogen or phosphorus. The nitrogen content of the leaves was not related to plant development, but low content and low utilization of phosphorus accompanied unsatisfactory development. Equilibrium between nitrogen and phosphorus throughout the season and a maintained rapid utilization of potassium at a high level were associated with good development.

The relation of plot size and shape to potato yield variations, T. M. Currence and F. A. Krantz. (Minn. Expt. Sta.). (*Amer. Potato Jour., 13 (1936), No. 11, pp. 310–313*).—Calculation of the standard errors in percentage of the mean for 24 different sizes of plats showed that the error was reduced very little between plats 2 and 9 rods long, while 18-rod plats were distinctly more uniform than 9-rod plats. The number of replicates of the various sized plats needed for a standard error of the mean of 3.5 percent is shown. More replications of small plats are preferred to few replications of large plats when a small area is to be planted. Conditions favoring larger plats are also indicated.

Growing better potatoes in Colorado, C. H. Metzger (*Colorado Sta. Bul. 446 (1938), pp. 127, figs. 93*).—Essentially a revision of the practical manual of potato production noted earlier (E. S. R., 72, p. 177), with an added section on potatoes as feed for beef cattle, dairy cows, sheep, swine, and horses.

Experiments on artificial hybridization of rice, N. E. Jodon. (U. S. D. A. and La. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 4, pp. 294–305, figs. 2*).—Rice florets were emasculated at Crowley, La., by immersion in water at 40°–44° C. for 10 min., an adaptation of the method of Stephens and Quinby with sorghum (E. S. R., 71, p. 625), which gave a better seed set than the clipping method of Jones (E. S. R., 61, p. 225) ; covering panicles was not needed; and the crossed seeds developed and germinated normally. Temperatures above 44° injured tissues and florets failed to open. Similar but less satisfactory results were obtained with water at from 0° to 6°, treatment somewhat similar to Suneson's method with wheat (E. S. R., 78, p. 178). Covering panicles with glassine bags increased seed set in clipped but not in unclipped florets.

Breeding rye by continuous selection, H. B. Sprague. (N. J. Expt. Stas.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 4, pp. 287–293, fig. 1*).—Each of 216 strains, selected from a mass variety of rye containing 10 varieties and strains after 2 yr. of natural crossing, was continued, 1928–37, by selection of superior plants in space-planted rows with open-pollination permitted between all lines in the nursery. In 1933, 98 lines chosen on yield performance during 1931 and 1932 were combined to form a variety named Raritan, which proved stable in yielding ability in subsequent generations, exceeding common rye by from 10 to 12 percent in grain yield. Further improvement in productivity by continued selection within each of the 216 lines for the 4 yr. ended in 1937 was indicated by the yielding ability of the best 95 lines and by that of the entire breeding nursery. The limitations and advantages of this system of breeding are discussed briefly. Cross-pollination between colored and colorless kerneled varieties growing adjacent seemed to approximate 50 percent, with less than 10 percent of the foreign pollen effective at 10 ft. distance under ordinary conditions.

Fertility as a factor in rye improvement, B. D. Leith and H. L. Shands. (Wis. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 5, pp. 406–418, figs. 3*).—Prolonged inbreeding with selections of Schlanstedt and Abruzzi rye showed that vigor in vegetative growth was usually less in the inbreds than in the open-pollinated rye. Many undesirable segregates appeared in inbreeding, and after 10 yr. of inbreeding some lines still showed segregation for size and shape of kernel. Fertility in inbred lines was increased by selection, averaging in the first 5 yr. of inbreeding and selection not over 6.5 percent, but in the last 4 yr. approximating 50 percent. Some crosses between inbred lines showed hybrid vigor and were superior to open-pollinated rye, while others were too inferior for continuation. In average fertility, the first and second year's selfing and selection of hybrids compared closely with that of the tenth and eleventh years' inbreds. The range of fertility distribution of selected inbreds from hybrids was wide, as in the case of inbred lines.

Registration of improved sorghum varieties, I, J. H. Parker. (U. S. D. A. and Kans. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 4, pp. 306–308*).—Varieties of sorghum approved for registration in 1937, supplementing the group of 73 varieties listed by Vinall, Stephens, and Martin (E. S. R., 76, p. 184) and approved in December 1936,[3] include Club, a selection from Dawn kafir, immune to *Pythium* disease of milo, relatively highly resistant to chinch bug injury, and of low infection by kernel smut; Finney milo, a selection resistant to *Pythium* root rot from Dwarf Yellow milo, which it resembles; and Early Kalo, a selection from and 10 days earlier than Kalo.

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[3] Jour. Amer. Soc. Agron., 28 (1936), No. 12, pp. 1027, 1028.

Effect of variety and stand of soybeans on relative yield and percentage of total nitrogen in tops and roots, W. B. ANDREWS and M. GIEGER. (Miss. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 5, pp. 434–437*).—Examination of roots of seven soybean varieties, secured from an area of 38.5 sq. ft. in 8×10 ft. plant spacing, showed that they might be grouped by root systems, as Laredo and Mamredo, which had about 9 percent of the total weight and about 8 percent of the total nitrogen in the roots; and Otootan, Biloxi, Delsta, Mammoth Yellow, and Tanloxi, with about 16 percent of the total weight and about 15 percent of the total nitrogen in the roots. The quantities of roots and of nitrogen left in a soil by roots of a good crop of soybeans appeared too small to affect the following crop materially. Roots of Mammoth Yellow soybeans grown in a thick and a thin stand composed, respectively, 30 and 15 percent of the total weight of the plant. In the thick stand 59 percent of the roots were fine and 41 percent were coarse.

Germination tests with sugar beet seed, A. W. SKUDERNA and C. W. DOXTATOR (*Jour. Amer. Soc. Agron., 30 (1938), No. 4, pp. 328–333*).—Results of tests at Rocky Ford, Colo., indicated the need for a random sample of beet seed mechanically reduced to proper sample size; presoaking of seed, especially older seed; the choice of either paper toweling or blotting paper; reporting results of tests at the end of 10 days; and, wherever possible, supplementing laboratory with field tests to determine vigor of seedling plants. Germinating beet seed at colder temperatures appeared desirable; the tentative choice of a 20° C. continuous temperature seemed warranted.

Character analysis of winter wheat varieties, W. W. WORZELLA and G. H. CUTLER. (Ind. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 5, pp. 430–433*).—The analysis of 11 characters of 30 varieties of soft and semihard winter wheat grown at La Fayette, 1933–37, revealed considerable variation in different varieties. Winter survival varied from 5.2 to 80.4 percent in the field and from 2 to 76.6 percent under artificial freezing tests, yield from 2.5 to 31.2 bu., gluten strength from 22 to 140 min., color or carotene from 1.92 to 4 p. p. m., and particle size index from 7.1 to 18 percent. Soft wheat varieties were not so winterhardy as semihard wheats under Indiana conditions; they possess a weaker gluten and a lower proportion of carotenoid pigments and produce a finer flour. Such a character analysis may be valuable in selecting parental stock.

Survival of wheat varieties in the Great Plains winterhardiness nursery, 1930–1937, K. S. QUISENBERRY. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 5, pp. 399–405*).—Continued cooperative winterhardiness studies (E. S. R., 64, p. 436), 1930–37, indicates Lutescens 0329, Buffum No. 17, and Minhardi as the most hardy winter wheats available. Varietal groups for hardiness included Lutescens 0329 and Minhardi and a few hybrid strains in the hardy group; Minturki, Turkey (C. I. 6152), and Nebraska No. 60 in the midhardy group; Cheyenne, Kanred, Oro, and Kharkof in the slightly hardy group; and Quivira, Blackhull, Tenmarq, and Early Blackhull in the tender group. Varieties may be arranged between the extremes in a gradually descending series from hardy to tender.

A simplified method for testing the lodging resistance of varieties and strains of wheat, I. M. ATKINS. (U. S. D. A. and Tex. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 4, pp. 309–313, figs. 3*).—The method used in earlier work (E. S. R., 79, p. 330) has been simplified, and is described in these pages with additional data on its accuracy and practicability.

Thorne wheat, C. A. LAMB (*[Ohio Sta.] Spec. Circ. 55 (1938), pp. 4, fig. 1*).—Thorne wheat, derived from a cross between Portage (a Poole selection) and Fulcaster, made by L. E Thatcher in 1917, resembles Portage more than Fulcaster, is a hardy awnless red-kerneled winter variety with brown chaff, very stiff straw, and erect spikes; is not immune to, although not affected much by, loose and stinking smuts and is susceptible to stem and leaf rusts; and is similar to Trumbull and Fulhio in milling quality, being acceptable to the soft wheat miller. The grand averages from more than 100 variety tests, 1926–38, were for Thorne 36.7, Fulhio 34 4, and Trumbull 33.7 bu. per acre.

Water requirement of wheat as influenced by the fertility of the soil, B. N. SINGH and B. K. MEHTA (*Jour. Amer. Soc. Agron., 30 (1938), No. 5, pp. 395–398, figs. 2*).—Increasing soil fertility by addition of fertilizers and manures reduced the quantity of water needed for unit dry matter production but increased the total quantity of water transpired by wheat. See also an earlier note (E. S. R., 73, p. 466).

Germ content of American wheats, C. H. BAILEY (*Cereal Chem., 15 (1938), No. 1, pp. 102–106, fig. 1*).—The percentage of germ in samples of typical American wheats ranged from 2.21 to 2.44 in hard red spring, from 1.74 to 2.45 in hard red winter, from 2.69 to 3.33 in durum, and from 2.37 to 2.85 in soft wheats. The respective averages were 2.29, 2.18, 2 94, and 2.66, and 2 61 for all samples tested.

The effect on wheat quality of long exposure to carbon tetrachloride, R. K. LARMOUR and H. N. BERGSTEINSSON (*Canad. Jour. Res., 16 (1938), No. 6, Sect. C, pp. 241–247*).—Marquis wheat samples stored at 21° C. for from 4 to 40 weeks with dosages of carbon tetrachloride from 1 to 20 cc were not damaged at 12 percent moisture content. Samples with 10 and 20 cc dosages of carbon tetrachloride at 18 percent moisture were undamaged after 10 weeks' storage except for a slight sour odor which disappeared on drying, but after 20 weeks' storage showed definite evidence of damage. Samples of 24 percent moisture kept well for 4 weeks without carbon tetrachloride, but those having the higher dosages were damaged. With longer storage all samples at 24 percent moisture spoiled no matter how treated.

Results of seed tests for 1938, B. G. SANBORN (*New Hampshire Sta. Bul. 309 (1938), pp. 22*).—Purity and germination percentages are tabulated for 392 official samples of field crop seed collected from dealers in New Hampshire during the year ended June 30, 1938.

The planting value of oats and barley collected from farmers' drills and granaries, W. F. CROSIER (*New York State Sta. Bul. 681 (1938), pp. 46, figs. 6*).—Examination of 176 samples of oats or mixed oats and barley seed, representing seed stocks planted on New York farms in 1937, for purity, weed and smut spore content, bushel and seed weight, and germination was supplemented by information on seed sources, variety, cleaning, and disease treatments.

Over 75 percent of the samples were grown on the farms where planted, and very few seed stocks were obtained from dealers. Cornellian and Ithacan oats were most generally planted, although many growers continued to sow low-yielding varieties. Many seed stocks were cleaned on the farm and a small percentage by a commercial mill, and a few were planted uncleaned. Over half the seed stocks were treated with either formaldehyde or an organic mercury compound. The bushel weight of uncleaned oats was not indicative of ultimate planting value. The removal of unfilled grains by a fanning mill markedly increased the apparent germination of many seed stocks of oats but not of barley. The locally grown oats were contaminated with such weed seeds as wild mustard, curled dock, and quackgrass, the percentage of which was reduced by cleaning. Other cereals were observed in some samples. Smut spores were present in all but two samples, and root rot and seedling blight organisms infected nearly one-half of the barley samples. A saprophytic *Alternaria* species common to the oats samples produced no actual disease but severely discolored the infested grains. A commercial organic mercury compound is suggested as a remedial measure.

Cost of bindweed eradication by the tillage method, J. V. Srb, L. S. Evans, and F. D. Keim. (Nebr. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 5, pp. 425–429*).—With standard tillage equipment used in field scale bindweed eradication studies in York and Lancaster Counties, Nebr., 1935–37, the total cost per acre per cultivation ranged from 32 to 34 ct. An interval of from 4 to 6 days of growth between cultivations is suggested as a means of reducing the total cultivations required and therefore the control cost. Excess trash should be burned before beginning clean cultivation with a duckfoot cultivator. Although 2 yr. of clean cultivation eradicated from 95 to 100 percent of the original stand of bindweed, supplementary treatment was needed to complete eradication. Indications were that bindweed can be eradicated by tillage under ordinary Nebraska field conditions for about $10 per acre.

HORTICULTURE

[Horticultural investigations at the United States Field Station, Sacaton, Ariz.], C. J. King, R. E. Beckett, and O. Parker (*U. S. Dept. Agr. Circ. 479 (1938), pp. 49–57, 60–63, figs. 5*).—Varietal and cultural information is presented on citrus, dates, grapes, figs, pistachios, truck crops, and ornamentals.

Horticulture at the Ohio Agricultural Experiment Station, Wooster, Ohio (*Ohio Sta. Spec. Circ. 54 (1938), pp. 64, figs. 16*).—This, the fifth of a series of biennial circulars (E. S. R., 75, p. 627), presents information on current experimental activities with fruits and vegetables, including potatoes and various ornamentals, and some of the results derived from such work. The work covered was carried on at Wooster, Columbus, Marietta, McGuffey, at several county farms and substations, and cooperatively with growers.

[Horticultural studies by the Tennessee Station], B. D. Drain and L. A. Fister (*Tennessee Sta. Rpt. 1937, pp. 37, 38, 39, 45, 46, 47, 53, 54, 55*).—Among projects briefly discussed are the breeding of the raspberry, pyrethrum, blight-resistant pears, leaf-spot-resistant tomatoes, and crown-rot-resistant rhubarb; varieties of sweet corn, small fruits, roses, and asparagus; control of the time of bloom in the chrysanthemum; and the protection of fruits from birds.

There are mentioned also varietal and cultural trials at the Mericourt Substation; and strawberry breeding and varietal and cultural trials with fruits and vegetables at the West Tennessee Substation.

[Horticultural studies by the Vermont Station] (*Vermont Sta. Bul. 438 (1938), pp. 28–30, 31*).—Included are brief reports of studies on the nature and control of bitter pit in the apple, underlying causes of sterility in pears, orchard fertilization, and rodent control.

Use of live sphagnum in seed germination, A. W. Close. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 858, 859*).—Good results were secured with live sphagnum as a germination medium in the case of approximately 2,500 species. The procedure was particularly valuable in such families as the Ericaceae, which are difficult to handle under ordinary conditions.

Body icing in transit refrigeration of vegetables, E. D. MALLISON and W. T. PENTZER (*U. S. Dept. Agr., Tech. Bul. 627* (*1938*), *pp. 42, figs. 14*).—Investigations were conducted on the transit refrigeration of head lettuce, cauliflower, and green corn, three of the principal vegetables shipped with ice placed in or about the package. Body ice was found to be necessary with lettuce and corn during the entire shipping season. While under certain favorable conditions, cauliflower could be transported without body ice, these conditions were so limited that use of body ice is recommended throughout the year. No difference was found between use of chunk ice and crushed body ice, so far as the commodity temperature during transit was concerned. The use of body ice gave such rapid cooling that precooling was found to be unnecessary. Using low-temperature body ice in direct contact with the lettuce caused freezing of the outer leaves during transit, even during the summer months, and during the colder months it resulted in more extensive freezing damage. Overpacking the crates caused excessive injury and bruising of the contents.

Correlated growth characteristics in cabbage [trans. title], L. M. KOPETZ (*Zuchter, 10* (*1938*), *No. 8, pp. 213–216, figs. 2*).—Working with a late cabbage, the author noted a correlation of +0.3855 between length of stump from the soil to the base of the head and the length of the stem within the head. High correlations were noted between the shape of the longitudinal cross section of the stump and that of the interior stem. A rectangular stump signified a rectangular interior stem, whereas a trapezoidal stump indicated a short interior triangular stalk. Correlations between stem form and the number of leaves were only slight.

Principles and problems of mushroom culture, E. B. LAMBERT. (U. S. D. A.). (*Bot. Rev., 4* (*1938*), *No. 7, pp. 397–426*).—This comprehensive discussion relates to the composts, culture, disease and insect control, species, etc., and includes a bibliography of 166 references.

Synthetic compost for mushroom growing, J. W. SINDEN (*Pennsylvania Sta. Bul. 365* (*1938*), *pp.* [2]+*27, figs. 2*).—A synthetic compost composed of wheat straw, urea, and wheat produced 444 lb. of mushrooms per ton of straw, or nearly the same as horse manure. The addition of wheat to the compost resulted in more rapid decomposition and larger yields than where no wheat was used. Rate of decomposition increased as urea was increased up to 32 lb. per ton of straw. Beyond this point, rate of decomposition declined. Yields of mushrooms from synthetic composts per ton of straw and also per square foot of bed decreased as the amount of decomposition increased, due, apparently, to a loss in organic matter. The procedure for making synthetic compost is discussed.

Influence of temperature and rainfall on speed of emergence of spinach seedlings (Spinacia oleracea), R. MAGRUDER, P. WORK, L. R. HAWTHORN, and G. W. SCOTT. (U. S. D. A., Cornell Univ., and Tex. and Calif. Expt. Stas.), (*Amer. Soc. Hort. Sci. Proc., 34* (*1937*), *pp. 625–629*).—Seed of eight varieties from a common source was sown at Ithaca, N. Y., Rosslyn, Va., Winter Haven, Tex., and Davis, Calif. Where excessive rainfall did not occur, lots of seed which encountered similar temperature conditions germinated in approximately the same number of days in the different localities. Where temperatures differed, the higher degrees hastened emergence. Excessive rainfall tended to delay emergence of spinach seedlings. There was also an indication that naturally fluctuating temperatures produced quicker germination and emergence than did constant temperatures maintained at a level equal to the mean of the natural fluctuations.

Fruit cracking of tomatoes as influenced by applying potassium permanganate to soils in which the transplants are grown, V. E. IVERSON (*Montana Sta. Bul. 362* (*1938*), *pp. 15, figs. 3*).—Applications of potassium permanganate at the rate of 0.2 g per pot to the surface of soil of potted Bonny Best tomato plants resulted in a materially increased evolution of carbon dioxide during the first 4 days, suggesting that either biological activity or chemical oxidation, or both, had been increased. Measurements of plants taken 45 days after the treatment showed a significant increase in plant height and stem diameter, as compared with the controls. Observations on the roots showed marked stimulation, particularly in the number of fibrous roots. Treatment of other plants with manganese chloride in equivalent amounts of manganese to the potassium permanganate treatments was followed by an equal stimulation, indicating that manganese was probably the active factor concerned.

Field studies with plants set in the open after 70 days in the greenhouse and trained to a single stem showed reduced cracking in the lots which had been treated with potassium permanganate in the transplant stage. That climatic conditions are also a factor in cracking of tomato fruit was indicated in different results secured in two successive years differing sharply in rainfall and relative humidity during the summer period.

Spectrophotometric and colorimetric analyses of tomato pulp, J. H. MACGILLIVRAY. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, *34* (*1937*), *pp. 630–634, figs. 3*).—Color measurements of identical tomato pulp samples with various instruments, such as the Munsell color disks, tintometer, colorimeter, photometer, and spectrophotometer, suggested that the Munsell system is accurate, practical, and economical for use under standardized conditions. The spectrophotometer should be used when the stimulus of color is to be measured, while for sensation of color either a colorimetric or spectrophotometric method may be employed.

Random notes on fruit tree rootstocks and plant propagation, III, H. B. TUKEY and K. D. BRASE (*New York State Sta. Bul. 682* (*1938*), *pp. 32, figs. 7*).—Among observations presented in this third paper (E. S. R., 75, p. 48) are that granulated peat moss mixed with the soil increased the growth of young apple trees in two of three plantings made in successive years. Well-rooted Malling stocks gave as good stands as lining-out stocks, as did good grades of branch-root seedlings. The time required to produce a budded tree was shortened by 1 yr. by starting seedlings in the greenhouse, transplanting in late spring, and budding in midsummer. Sour cherries wintered out-of-doors made better growth than comparable stock stored in the nursery cellar. Paper mulch for nursery apple trees proved equal, if not superior, to intensive clean cultivation. The budding of apple stock at from 3 to 4 in. above the crown gave slightly larger trees than budding at from 1 to 2 in. and much better results than budding at or below the crown. Abundant starch grains in the roots of vigorous pear trees distinguished them from weak trees. Uniform growth and conformation were noted in 6-year-old Early McIntosh trees budded on good-quality French crab seedlings. The low viability and poor germination of *Malus hupehensis* seeds (apogamic development) made them unsuitable as rootstock material. Peat moss proved valuable as a surface coverage for seed beds and as a complete cover over seeds planted under unfavorable conditions.

"Incubator" fruit trees mark an advance in breeding, H. B. TUKEY (*Farm Res.* [*New York State Sta.*], *4*, (*1938*), *No. 4*, *pp. 1, 7, figs. 3*).—A popular description is offered of a new technic in which the embryo was removed from the mother fruit during the growing season and grown on a nutrient agar under aseptic conditions.

Promising new fruits (*Farm Res.* [*New York State Sta.*], *4* (*1938*), *No. 4*, *p. 8*).—A list is presented of 14 new fruits bred and named by the station, as follows: Alton, Dunning, Greendale, Redhook, Webster, Redfield, and Redford apples; Athens, Eden, Buffalo, and Ruby grapes; Caywood pear; Sodus cherry; and Dresden strawberry.

Soluble pectin changes in gas stored fruit, R. M. SMOCK and F. W. ALLEN. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, *34* (*1937*), *pp. 184–187*, *figs. 3*).—Following storage at 32° and 45° F. in air and at 45° in a 5-percent carbon dioxide 15-percent oxygen atmosphere, and in a 10-percent carbon dioxide 10-percent oxygen atmosphere, Bartlett and Hardy pears, Wickson plums, Elberta peaches, and yellow Newtown apples were analyzed for soluble pectin. At 45°, normal soluble pectin increases in the peach, pear, and apple were retarded by carbon dioxide storage. In varieties with a considerable content of soluble pectin, the determination of change from pectose to pectin is judged a good criterion of the rate of softening. In the pear there was some indication of residual effect of gas treatment in the ripening period.

Soils in relation to fruit growing in New York.—XII, Tree behavior on important soil profiles in the Peru, Plattsburg, and Crown Point areas in Clinton and Essex Counties, J. OSKAMP ([*New York*] *Cornell Sta. Bul. 705* (*1938*), *pp. 27*, *figs. 22*).—By the use of soil tubes and trenches dug beneath representative trees, in continuation of this series (E. S. R., 77, p. 752), observations were made on the character of the soil and the type of apple root development on several different soil types in the Champlain Valley section of New York. The deepest-rooted, largest, and most thrifty trees were found where the soil profile was of a fairly uniform texture and brown in color, usually bright and uniform as in the Alton series, but sometimes with slight grayness and mottling as in the Vergennes. The important characteristics of the different soils are described and their relation to tree development is discussed. One of the most obvious soil-orchard relationships was the presence of a very compact unweathered glacial till which apple roots did not penetrate to any extent. In a few instances, bedrock was the obstructing medium. Dull color and mottled subsoils appeared more general in the Champlain Valley than in other fruit-growing sections of the State. In general, however, the orchard soils of the Champlain Valley, although formed from different rock and under slightly different conditions, exhibited essentially the same general profile characteristics in relation to orchard behavior as were found to exist in other fruit areas of the State.

Growth and fruitfulness of three apple varieties on French crab seedlings and on a clonal stock, G. E. YERKES, R. H. SUDDS, and W. S. CLARKE. (W. Va. and Pa. Expt. Stas. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, *34* (*1937*), *pp. 363–368*).—Records obtained over an 11-yr. period on the comparative growth and yield of Delicious, Winesap, and Stayman Winesap apples on a selected clonal stock known as T–200 and on French crab seedlings showed definite varietal responses. The Delicious trees on T–200 were more uniform and averaged nearly the same size as those on the seedlings. The yields were also apparently more uniform. The Winesaps were more uniform both in growth and yield on T–200, but the trees were somewhat dwarfed. Stayman Winesap on T–200 was more variable in growth and yield, and the trees were very much dwarfed. The need of thorough testing of clons before general distribution as stocks is urged.

Malling stock influence on fruit size and shape, L. Southwick. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 359–361, fig. 1*).—Measurements of McIntosh and Wealthy apples taken from trees on known rootstocks indicated that certain stocks had a slight but significant influence on the form and size of the fruits. In general, individual fruit size declined with the advancing age of the trees. The vigorous so-called standard stocks produced the largest apples.

Apical dominance in shoots and proximal dominance in roots as related to structural framework of the apple, F. Horsfall, Jr., and C. G. Vinson (*Missouri Sta. Res. Bul. 293 (1938), pp. 23, figs. 16*).—The immersion of unbranched yearling Jonathan trees in aqueous solutions of thiourea, followed by different disbudding treatments, retarded the development of distal buds so that the upper branches were not dominant the first year. The cutting-back of 4-year-old Delicious trees resulted, in some cases, in the lower laterals' outgrowing the terminal. A lack of sufficient water and light reduction to 380 footcandles or the development of several shoots favored inhibition of laterals in cut-back trees. The more rapid enlargement of the trunk than of the young scaffold branches apparently forced the widening of the angle while the tissues of the lateral were still soft. Adhesive tape wound around the trunk and a tender side shoot reduced markedly the angle between the two. Spiral girdles on 1-year-old scaffold branches resulted in a changed direction of the longitudinal axis from parallel with the limb to parallel with the spiral. Soaking sweetpotato roots in thiourea solutions overcame proximal dominance so that both the first and second crops of slips developed over the entire surface of the potato.

A study of growth rates in Stayman Winesap apples, L. Verner. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 128–131, fig. 1*).—Daily measurements taken over a 7-week period beginning in late July 1933 on Stayman Winesap apples growing at Kearneysville, W. Va., showed that the fruits did not enlarge at a uniform rate but that growth was characterized by daily changes which were sometimes rather abrupt. Of environmental factors, fluctuations in the evaporating power of the air corresponded most closely with changes in fruit growth. The short periods of rapid growth following a sudden decline in evaporating rate are due primarily to swelling of tissues from increased hydration. Days of heavy rainfall coincided usually with days of rapid fruit growth. It is deemed likely that records taken at other than daily intervals would show more clearly the relationship of atmospheric evaporation to fruit growth.

The size of apples in relation to their location on the tree, D. G. White. (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 132–134*).—In the heavy crop year of 1937, typical inside twigs bearing fruit were cut from King David, Winesap, Jonathan, and Rome Beauty trees and compared with comparable twigs and fruit from the exterior of the trees. Despite the larger leaf surface available, the interior apples were significantly smaller in size. Calculated as percentages of grams of leaves per fruit, much greater weight of leaves was required to produce the same size apple in the interior as on the periphery of the trees. The average inside leaves were much thinner than the outside, and the average footcandles of light on clear days was only 493 on the inside and 9,733 on the outside of the tree.

The effects of stocks on the yield of Grimes apples, J. A. McClintock. (Purdue Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 369–371*).—Yield records taken over the 4-yr. period, 1934–37, on Grimes Golden trees worked on 13 different stocks and set out in the orchard in the spring of 1922 showed

Virginia crab to be outstandingly the most effective rootstock. Trees on it were the largest of all, and measurements of the fruits in 1936 showed the largest percentages of large apples. Green weight records on leaves collected in October 1937 showed the leaves of the Virginia crab group to be much heavier, leading to the suggestion that this greater functional capacity of the leaves may explain the superior growth and yield of the trees.

Skin-cracking of York apples as related to spray injury, A. L. Schrader and I. C. Haut. (Univ. Md.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 180–183, fig. 1*).—Apparently several factors, notably soil-moisture relationships, spray residues, and weather play a part in the skin-cracking of apples. In 1937 York fruits covered with a single thickness of muslin from June 15 to harvest developed a high waxy finish with no cracking and few corky lenticels. Coating of apples with a commercial miscible wax had some beneficial effects, but the waxed fruits did not color as well as the controls. The development of horizontal cracks on fruits in the same manner that drops of spray dried is believed an indication of a spray injury relationship to cracking. Heavy sprays of lead arsenate in late season are considered potential sources of trouble.

Fertilizer trials with sour cherries under limited irrigation.—I, Yields and fruit size, L. R. Bryant, R. Gardner, and J. B. Goodwin. (Colo. State Col. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 347–351, fig. 1*).—Studies in a mature Montmorency cherry orchard in which there was seldom sufficient soil moisture throughout the year showed the largest yield from nitrogen (sulfate of ammonia). Manure was next. The yields with phosphorus alone, potash alone, and with combined nitrogen, phosphorus, and potash were not significantly larger than the controls. Since there was no significant increase in the size of cherries, the authors conclude that increased yields were due to greater numbers of setting and maturing fruits.

Peach breeding project, M. J. Dorsey. (Univ. Ill.). (*Ill. State Hort. Soc. Trans., 71 (1937), pp. 386–392*).—Outlining briefly the technic of peach breeding employed, the author discusses some of the more recent developments, particularly with reference to the results of crosses in which J. H. Hale was used as one parent. Of 56 seedlings from the cross J. H. Hale × Elberta, 32 were freestone and 24 clingstones. All had yellow flesh. Good pollen occurred in 42 and typical aborted pollen of J. H. Hale in the other 14. Two of the more promising seedlings are described.

The peach orchard of the future for Maryland, with special reference to planting distances and varieties, A. L. Schrader. (Univ. Md.). (*Peninsula Hort. Soc. [Del.] Trans., 51 (1937), pp. 159–163*) —Observations on Hiley, Belle, and Elberta peach trees set out with various spacings in a fertile Chester clay loam near Colesville, Md., showed significantly larger yields and more vigorous growth with the wider spacings. The individual fruits were larger on the wider-spaced trees.

Experiences in propagating Rubus and other species by leaf-bud cuttings, E. Angelo. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 448–450*).—A high percentage of successful rooting was obtained with leaf cuttings of the black raspberry when the correct type of material was used and the proper type of environment provided. Leaves from the central part of the cane and with a substantial heel were most successful. Clean, sharp sand, regular watering, and high humidity all appeared essential. Cuttings taken in late September developed a rosette type of growth. Good success was had with rose, mock orange, and gooseberry. *Prunus tomentosa* and *P. japonica* rooted freely but made no top growth.

The carbon dioxide treatment of raspberries and strawberries, J. D. Winter, R. H. Landon, A. C. Vogele, and W. H. Alderman. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 188–192*).—In studies with crated Latham raspberries stored for from 4 to 6 hr. in a chamber in which from 3 to 5 lb. of carbon dioxide were used to 40 cu. ft., there was observed an improvement in subsequent shipping quality. When 4.5 lb. of carbon dioxide were used and the fruit held for 24 hr. or more, a slightly objectionable flavor which, however, disappeared in less than an hour was noted. Favorable results were secured with Premier and Beaver strawberries with 1.75 lb. of carbon dioxide in the 40-ft. chamber. Even with 2.5 and 3 lb. of carbon dioxide, good results were secured. The treatment of fall-crop strawberries also gave good results in prolonging life, in lessening decay, and in maintaining attractive appearance.

Freezing injury to strawberry flower buds, flowers, and young fruits, L. Havis (*Ohio Sta. Bimo. Bul. 194 (1938), pp. 168–172, figs. 1*).—A record is presented of the nature and extent of injury to varieties of strawberries as a result of a belated frost on May 12, 1938. Varieties differed (1) in relative resistance of the receptacles of the flowers and fruits, (2) in resistance to embryo injury, and (3) in their capacity to develop marketable fruits despite some injury. All types of injury were most severe in the early opening blooms in all varieties. Premier was outstanding in its resistance to embryo injury. Wayzata and Gem, everbearers, appeared especially hardy but are limited in commercial value.

Breeding strawberries for Texas, E. Mortensen and S. H. Yarnell. (Tex Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 57–59*).—Seeking varieties possessing disease resistance, good quality, and a capacity to form plants during the hot summer months, crosses were made using as parents Missionary and Klondike, the leading commercial varieties, and several others such as Blakemore, "Banner," Redheart, Texas, and Thompson. There were obtained some promising seedlings, and the genetic results showed that certain parental combinations, such as Missionary × Banner and Blakemore × Banner, were much more productive of promising seedlings than were others.

Grape growing in Florida, R. D. Dickey and K. W. Loucks (*Florida Sta. Bul. 324 (1938), pp. 36, figs. 14*).—This contains general information relating to species and varieties, propagation, planting, training, fertilization, pollination, control of diseases and insects, harvesting, etc.

The influence of rootstocks on the yield and vigor of American grapes, J. E. Vaile. (Univ. Ark.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 471–474*).—Observations on Moore Early, Campbell Early, and Concord on own roots and on various stocks, such as Cynthiana, Wine King, and Rupestris St. George, showed much better growth and yields on practically all the stocks than on own roots. In Concord, for example, the average yield per vine per year was 14.09±0.87 lb. on own roots, as compared with 35.05±3.33 lb. on the best rootstocks. Positive correlation was established between yield and vigor, vigor and cluster size, and cluster size and cluster number.

The relation of flower cluster thinning and light pruning to yields of American grapes, P. H. Shepard (*Amer. Pomol. Soc. Proc., 53 (1937), pp. 59–62*).—Concord, August Giant, Lindley, Eaton, and Merrimac vines pruned to 40, 60, 80, and 100 buds yielded the most fruit with the maximum number of buds, only one cluster being left per shoot. In Concord, Lindley, and Eaton the average weight of clusters was reduced somewhat on the 100-bud vines, but not to a serious degree. In August Giant the clusters were of the same weight and in Merrimac the 100-bud group produced slightly larger clusters.

The results suggest that flower cluster thinning offsets the depressing effect of overproduction and also the need of determining for each variety the optimum number of buds.

Relationship of leaf pigments and total solids content to uneven coloring of Concord grapes, J. E. Webster, R. Black, and F. B. Cross. (Okla. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 475–479*).—Continuing studies on the cause of uneven ripening in the Concord grape (E. S. R., 74, p. 346), a comparison was made of the chlorophyll, carotene, and xanthophyll content of Concord leaves with those of other varieties, with the differences observed inadequate to account for the different behavior in regard to ripening. However, Concord leaves appeared significantly higher in total-solids content, which, coupled with a low-solids content in the fruit, may have a bearing on the uneven ripening.

The pollination of the cultivated blueberry, J. S. Bailey. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 71, 72*).—Selfpollination of tent-covered Adams, Cabot, Dunfee, Grover, Harding, Katherine, Pioneer, and Rubel blueberries resulted in few and small fruits. Pioneer when covered and selfed produced no fruit, as compared with excellent crops on adjacent bushes in the open. Rubel set a small crop when selfed. Of the three varieties, Cabot, Pioneer, and Rubel, deemed of commercial value in Massachusetts, Rubel was most fruitful when selfed but did not set satisfactory crops in any of 3 yr.

Low temperature injury to citrus in the Salt River Valley of Arizona, R. H. Hilgeman and J. G. Smith. (Univ. Ariz.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 138–142, fig. 1*).—Following a period of 20 days in which the temperature dropped below 32° F. on 11 days, citrus fruits were exposed to a succession of 4 very cold days during which minima of 18° and 19° were reached. Observations showed that thrifty grapefruit trees growing in heavy soil and irrigated during the freeze suffered the least defoliation and fruit damage. Grapefruits showed some refilling with juice, but to a commercial extent only in moderately injured fruits. Valencia oranges showed no gain in percentage of juice, but expansion of the uninjured sacs occurred though not sufficiently to compensate for the injured tissues. Recovery in either grapefruit or oranges was not sufficient, except where injury was moderate (less than 40 percent), to have significance.

The reclamation of decadent citrus trees, W. H. Friend. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 143–146*).—Salinity and alkalinity were indicated as the principal factors concerned in the early decline of citrus trees in the lower Río Grande Valley. Planting only on soils with effective subsoil drainage was urged. In the case of existing orchards, the use of acid-forming materials, along with liberal amounts of organic matter and possibly some of the so-called minor elements, was indicated.

A preliminary report on the effects of fertilizing practices upon maturity and quality of Marsh grapefruit in Arizona, R. H. Hilgeman, C. W. Van Horn, and W. E. Martin. (Univ. Ariz.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 352–355*).—Observations on Marsh grapefruit from plats in the Yuma Mesa experimental orchard showed no significant effects on quality from supplemental fertilizer applications where a basic treatment of 5 tons of manure per acre was applied. Seasonal changes in acid content, skin thickness, and yield were far greater than differences due to fertilizers. The percentage of juice was apparently not influenced significantly by either fertilizer or seasonal conditions. Thickness of the skin appeared to be associated with the number of fruits on the trees. No consistent differences in maturity, as shown in the total-soluble-solids to percentage-of-acid ratio, were noted in association with any fertilizer treatment.

The primary flower types of papaya and the fruit types that develop from them, W. B. Storey. (Hawaii Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 80–82, figs. 2*).—Five primary flower types, one purely pistillate, three hermaphrodites, and one purely staminate, were recognized in the papaya and are described, together with notes on the resulting fruits.

Assimilation of ammonium and nitrate by pineapple plants grown in nutrient solutions and its effects on nitrogenous and carbohydrate constituents, C. P. Sideris, B. H. Krauss, and H. Y. Young. (Univ. Hawaii). (*Plant Physiol., 13 (1938), No. 3, pp. 489–527, figs. 22*).—Nitrate nitrogen was neither absorbed or assimilated as readily as ammonium nitrogen, which was apparently assimilated in the roots as rapidly as absorbed, the immediate products being amino acids and small quantities of glutamine and asparagine. Nitrate was assimilated very slowly, if at all, in the root tissues and was translocated through the stem and nonchlorophyllous tissues of the leaf bases presumably to the chlorophyllous tissues. Plants in the ammonium series contained in their nonchlorophyllous tissues comparatively great amounts of soluble organic nitrogen and small quantities of protein. The nitrate group had in their roots large quantities of protein as compared with soluble organic nitrogen. The amounts of reducing sugars and sucrose were in general somewhat greater in the leaf tissues of the plants with nitrate than with ammonium, indicating a lower rate of carbohydrate utilization in the nitrate group.

Seasonal variations in the carbohydrate and nitrogen content of roots of bearing pecan trees, C. L. Smith and J. C. Waugh. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 6, pp. 449–460, fig. 1*).—Analyses of lateral roots of the pecan collected at different intervals in the "off" and "on" years showed that starch tends to reach a maximum in late autumn, decreasing thereafter to a minimum in early summer. Starch was the most variable of the constituents determined, and its concentration appeared to have a marked influence on fruiting. The rapid disappearance of starch during spring growth and blooming and the decrease of both starch and hemicellulose during the nut-filling season suggested that both growth and fruiting are exhaustive processes. Nonreducing sugars were present in appreciable quantities and varied with the starch but to a lesser degree. Reducing sugars were low and showed no seasonal variations. Total nitrogen was low in the roots at all times but showed a decrease during the rapid spring growth period and increase in winter when soil conditions favored nitrogen absorption.

Further notes on the effects of soil management on the growth in diameter of pecan nuts, C. W. Van Horn. (Univ. Ariz. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 356–358, fig. 1*).—Weekly measurements of the diameter of pecan nuts, with and without the shucks, indicated that under the existing conditions of the Yuma Valley, with high underground water, differential irrigation practices do not affect materially the diameter of the nuts at harvest. The nut itself reached a maximum diameter early in September, although the shuck showed further increase. Thickness of the shuck appeared to reflect more closely differences in the vegetativeness of the trees than did measurements of the nut.

Rooting response of azaleas and other ericaceous plants to auxin treatments, H. T. Skinner. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 830–838, fig. 1*).—Summer cuttings of many ericaceous genera, such as *Kalmia, Rhododendron, Erica,* and *Leucothoe,* rooted without special treatment but with the majority treated with indolebutyric acid resulted in a higher percentage of success. The auxin treatments hastened rooting by an average of 2 weeks and resulted in larger root systems. Indolebutyric was more effective than was indoleacetic acid. Inferior or negative results were secured with 6 of the 45 species tested.

Metaphase pairing in Lilium longiflorum "Giganteum" and the "Creole" lily, S. L. EMSWELLER and P. BRIERLEY. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), p. 824*).—In the Creole lily there was observed a considerable frequency of unpaired univalents. In Giganteum, metaphase pairing was very regular.

Temperature and humidity requirements for the storage of dahlia roots, R. C. ALLEN. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 770–773*).—With relative humidity maintained at 75 percent, there was no striking difference in the loss of weight of stored tubers within the range of 35° to 65° F. At 65° there was a tendency to sprout, and at 35° the roots were slow in sprouting after planting, leading to the suggestion that the ideal temperature range for storing dahlias is probably between 40° and 45°, with the optimum relative humidity between 80 and 85 percent. Coating tubers with paraffin decreased greatly the weight loss. Peat moss with a moisture content of 50 percent proved a favorable medium in which to store dahlia roots.

Humidity studies on narcissus bulb storage, E. P. HUME. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 850–853*).—Rooting in storage was controlled by regulating the relative humidity. With poorly cured King Alfred bulbs, the minimum below which the bulbs would not root was approximately 55 percent. The next year with well-cured bulbs the minimum was much higher, almost 70 percent. Lower humidities were undesirable since the bulbs lost more water, were slower to start upon planting, and produced short-stemmed blooms. Extremely low humidities caused the death of numerous bulbs.

Factors affecting the growth of tulips and narcissi in relation to garden practice, R. C. ALLEN. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 825–829*).—Measured by increase in weight of the bulbs, early autumn planting, covering with 4 in. of soil above the bulbs, delayed digging in the spring, fertilizing with various materials, and retention of the leaves in spring, were all desirable practices.

Periodicity in King Alfred narcissus bulbs, D. V. LUMSDEN. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), p. 854*).—The morphological development of the narcissus is described, following through from the time the first leaf primordia appeared in the central meristematic region until anthesis. Nearly 2 yr. elapsed from the time the first scale leaf is differentiated until blooming.

Improving Colorado home grounds: A guide for the home owner, G. A. BEACH (*Colorado Sta. Bul. 445 (1938), pp. 49, figs. 50*).—This contains general information as to species, arrangement, care of the plants, etc.

Ornamental plantings on station grounds.—III, Deciduous trees, G. P. VAN ESELTINE (*Farm Res. [New York State Sta.], 4 (1938), No. 4, pp. 6, 7, fig. 1*).—This is the third popular article on decorative species (E. S. R., 79, p. 632).

Ornamental hedges for Florida, H. MOWRY and R. D. DICKEY (*Florida Sta. Bul. 323 (1938), pp. 32 figs. 23*).—A revision of an earlier bulletin (E. S. R., 51, p. 842), this presents in a like manner information on planting, cultural care, pruning, desirable species, varieties, etc.

FORESTRY

[Forestry studies by the Vermont Station] (*Vermont Sta. Bul. 438 (1938), pp. 25–27*).—Brief reports are given on the effects of soil temperature on seed germination and seedling development, forest reproduction, ecological factors as influenced by the thinning of forest plantations, and the pruning of the white pine.

Forests for erosion control, E. N. Munns, J. F. Preston, and I. H. Sims (*U. S. Dept. Agr. Yearbook 1938, pp. 609–614*).—This article explains the protective effect of forests upon the soil, gives examples of their efficiency, and briefly surveys the present needs for reforestation in the United States.

Management of forest soils, I. H. Sims, E. N. Munns, and J. T. Auten (*U. S. Dept. Agr. Yearbook 1938, pp. 737–750, figs. 6*).—The authors describe how forest soils are formed; show how unwise cutting, forest fires, and overgrazing all have harmful effects on these soils; discuss some general principles involved in maintaining the soils in good condition, and in building up new forests rapidly; and show that the need of reforesting in the United States is progressively increasing.

The influence of nitrogenous fertilizer applications upon seed production of certain deciduous forest trees, R. F. Chandler, Jr. (Cornell Univ.). (*Jour. Forestry, 36 (1938), No. 8, pp. 761–766*).—Using equal parts of ammonium sulfate and sodium nitrate in applications of 1,600, 3,200, and 4,800 lb. per acre, the author observed a highly significant increase in the total number of seeds produced by both beech and sugar maple trees growing in a mixed, second-growth, uneven-aged stand near Ithaca, N. Y. The stimulation was greater in the maple. The percentage of sound seed and dry weight of individual seeds were increased in the maple but not significantly in the beech. The total nitrogen content of the leaves in September following the April fertilizer treatment, expressed as percentage of dry weight, averaged 2.73 and 2.98 percent for beech and maple, as compared with 2.03 and 1.55 percent in the controls.

Planting experiments in the Northeast, H. I. Baldwin (*Jour. Forestry, 36 (1938), No. 8, pp. 758–760*).—Planting experiments in northwestern Maine and New Hampshire suggested that fall planting may be successfully employed except in the case of hard pines such as red and Scotch. Comparison of slit and hole planting methods showed that the former gives good results on heavy soils, especially with fall planting, but that hole planting is generally superior with respect to survival and growth rate the first year or two. Small stock was not adapted to slit planting. The growth of trees set in plowed furrows was better in the first 2 yr. than that of trees set in sod.

Influence of the length of day on the dormancy of tree seedlings, F. G. Gustafson (*Plant Physiol., 13 (1938), No. 3, pp. 655–658, fig. 1*).—*Pinus resinosa* seedlings, protected from freezing in winter, made either no or very slight growth in the succeeding summer unless provided with a day length of about 16 hr.

Root development as a factor in the success or failure of windbreak trees in the southern high plains, M. T. Bunger and H. J. Thomson (*Jour. Forestry, 36 (1938), No. 8, pp. 790–803, figs. 6*).—Observations on trees in the windbreaks at the Panhandle Experiment Station, Goodwell, Okla., and in the general area showed roots of Asiatic elm, Osage orange, red cedar, and black locust at depths of from 24.5 to 27 ft. Russian mulberry and thornless honey locust penetrated to from 11 to 12.5 ft., while seedling apricot, black walnut, and ash penetrated only to from 5.5 to 7.5 ft. In close plantings, the lateral spread of roots was reduced greatly. Under the dry conditions of the high plains, the maturity of a species depended upon available soil moisture. Shallow- and deep-rooted trees should not be interplanted nor should trees be set nearer than 20 ft. apart to secure vigorous growth.

Vegetative propagation of white pine as a possible method of blister rust control, N. T. MIROV. (U. S. D. A. and Univ. Calif.). (*Jour. Forestry, 36 (1938), No. 8, pp. 807, 808*).—At Berkeley, Calif., cuttings of white pine *Pinus strobus* taken in December from 10-year-old trees and set in coarse sand in a frame where the temperature of the soil was held at from 74° to 78° F. rooted successfully. Before planting, the ends of the cuttings were submerged in warm water for 2 hr. in order to remove as much oleoresin as possible.

Rate of spread of surface fires in the ponderosa pine type of California, J. R. CURRY and W. L. FONS. (U. S. D. A. and Univ. Calif.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 4, pp. 239–267, figs. 17*).—Analyses of records taken on approximately 160 experimental fires ranging from 16 to 22 min. in duration and located in selected even-aged second-growth stands of ponderosa pine showed that the influence of both moisture and wind may be described as linear, with the slope of the curves varying with the time factor. Under low wind conditions, the maximum rate of spread as controlled by the moisture content was soon reached. With higher velocities, the period required to attain maximum rate of spread increased, and in some instances did not reach a maximum at the end of the longest period (22 min.). The effect of slope on rate of spread was curvilinear and related to the occurrence of winds and the direction of the slope. Empirical formulas derived from the smoothed curves permit estimates of rate of perimeter increase or total perimeter at any time interval within the limits of the data. Apparently, the prediction of total perimeter may be possible within a reasonable error of estimate. Extension of rate-of-spread studies to other forest types is believed dependent upon research leading to methods of evaluating the factor of fuel variation.

Lighter cuts and larger yields in ponderosa pine, G. A. PEARSON. (U. S. D. A. and Univ. Ariz.). (*Jour. Forestry, 36 (1938), No. 8, pp. 779–789, figs. 4*).—The net annual increment of immature or "blackjack" stands was estimated at about 3 percent of the original volume, while that of trees over 225 yr. approached this figure only with a larger reserved volume and where mortality was low. The rate of mortality based on volume rises rapidly beyond the 24-inch-diameter class. On a 400-acre plat, the portion of the stand that was above 30 in. d.b.h. at the time of cutting lost 28 percent of its original volume in 20 yr. Leaving a larger volume in the first cut will increase the net increment up to a certain point, beyond which mortality tends to offset the gain.

DISEASES OF PLANTS

Plant diseases assume a major role in agriculture, O. A. REINKING (*Farm Res. [New York State Sta.], 4 (1938), No. 4, pp. 5, 9*).—This is a general discussion of the relations of plant disease to agriculture, indicating that successful farmers practice the broad principles of control, including spray, dust, and seed treatments, use of resistant varieties, and sanitation.

The Plant Disease Reporter, September 15 and October 1, 1938 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 22 (1938), Nos. 17, pp. 353–363, figs. 2; 18, pp. 365–377, figs. 2*).—The following items are included:

No. 17.—New or unusual records of apple diseases (northwestern apple tree anthracnose found in Maine, and blister spot on Rome Beauty apples in Missouri); plant diseases caused by *Pythium* spp. observed in California in 1938, by J. T. Middleton; some new hosts for white rust and downy mildew fungi, and *Sclerotinia* on *Zinnia* and *Gloxinia* reported from California; rusts recorded from new localities, including *Endophyllum sempervivi* on *Sempervivum* sp. in New Jersey and New York, *Uredo nigropuncta* on *Epidendrum tampense* and

U. guacae on *E. nocturnum* in Florida, and *Puccinia fraseri* on *Hieracium venosum* in West Virginia, by J. A. Stevenson; tobacco diseases in the field in Wisconsin, 1938, by J. Johnson; cotton root rot in south central Texas, by W. N. Ezekiel; and brief notes on plant diseases, including southern blight and leaf spot of peanuts in Texas, downy mildew on watermelon in eastern Virginia, cabbage seedbed diseases in the Rio Grande Valley of Texas, *Helminthosporium* leaf spot on corn in Indiana, and *Septoria* on bromegrass in Nebraska.

No. 18.—Bacterial diseases in 1938, by H. W. Anderson and H. H. Thornberry; an isolated instance of bean anthracnose in California under overhead irrigation, by W. C. Snyder; diseases found on direct-seeded tomato fields, by H. R. Thomas and L. C. Shenberger; observations on cereal diseases, by H. B. Humphrey; the cereal disease situation in the Palouse region of Idaho and adjacent areas in 1938, by W. M. Bever; wheat foot-rots in Kansas in 1938, by H. Fellows; *Aplanobacter stewarti, Helminthosporium turcicum,* and *Diplodia zeae* unusually prevalent on corn in Illinois, by B. Koehler: incidence of ear rots in the 1937 corn crop, by N. E. Stevens; and brief notes on blister spot on apples in Pennsylvania and bacterial pustule on soybeans in Georgia.

[Plant diseases in California], D. G. MILBRATH (*Calif. Dept. Agr. Bul., 26 (1937), No. 4, pp. 533–539*).—This briefly summarizes work on western celery mosaic, a virus disease; peach mosaic; inspection of peaches and nectarines, and tree removal for diseases; spread of peach mosaic (1936–37); status of chestnut blight in 1937; and evaluation of fungicides; and gives a tabulation and discussion of causes of plant diseases on specimens received and diagnosed.

Plant pathology [at the Tennessee Station], C. D. SHERBAKOFF. (*Partly* coop. U. S. D. A.). (*Tennessee Sta. Rpt. 1937, pp. 42–44*).—Brief statements of progress are given relative to work on cotton wilt varietal tests against strains of the causal *Fusarium;* selection and crossing for wilt resistance in tomatoes; breeding for strawberry black root; red clover breeding for resistance to several diseases prevalent in the South; tomato breeding for resistance to leaf spots; and tests of fungicides for potato early blight.

[Plant disease studies by the Vermont Station] (*Vermont Sta. Bul. 438 (1938), pp. 30, 31–33*).—Brief reports are included on the critical period of apple scab infection in relation to spray schedules, the relative efficiency of flotation sulfur and lime-sulfur, and the effect of these fungicides on apple foliage; the effects of nitrogen in retarding senescence in plants; and soil infestation and reinfestation with the potato scab organism.

Departures from ordinary methods in controlling plant diseases, N. E. STEVENS. (Univ. Ill.). (*Bot. Rev., 4 (1938), No. 8, pp. 429–445*).—This review (with 52 literature references) discusses the control of storage diseases of fruits by use of impregnated wraps, oils and waxes applied directly to fruit, low temperature gas storage, heat treatments of seeds and of plant parts other than seeds or bulbs, heat treatments to control virus diseases, unusual methods of seed treatment, alternate changes in soil acidity, trenching, prevention of mold in sprouting mung beans, double working to prevent collar rot in apple trees, forest practice, use of fire in controlling brown-spot needle blight of pine, control of certain diseases in forest nurseries, and prevention of "leaf drop" in cranberries.

Soil disinfection, G. O. RANDALL. (Univ. N. C.). (*Amer. Nurseryman, 68 (1938), No. 5, pp. 3, 4*).—Methods of soil disinfection by heat and chemicals are discussed.

Transmissible lysins in water extracts of seeds, R. C. THOMAS. (Ohio Expt. Sta.). (*Science, 88 (1938), No. 2272, pp. 56, 57*).—Using *Aplanobacter* (=*Phytomonas*) *stewarti* as test organism, very strong transmissible lytic factors (bacteriophages) were found in aqueous extracts of living seeds of rye, oats, winter wheat, and of foxtail, redtop, and timothy grasses. Basing the conclusion on seven points of comparison (noted), it is believed almost certain that the lysins of seed extracts are identical with the lytic factor found in fire blight canker.

Viruses and virus diseases, T. M. Rivers (*Bul. N. Y. Acad. Med., 2, ser., 14 (1938), No. 7, pp. 383–397*).—This analysis and discussion of the general virus problem refers to it as the "twentieth century version of the de novo origin of infectious agents and its significance in relation to the control of disease."

A discussion on new aspects of virus disease, R. W. Salaman et al. (*Roy. Soc. [London], Proc., Ser. B, 125 (1938), No. 840, pp. 291–310*).—Critical discussions by R. N. Salaman, K. M. Smith and W. D. MacClement, F. C. Bawden, J. B. Bernal, A. S. McFarlane, G. M. Findlay, M. A. Watson, P. A. Murphy, and W. J. Elford of recent advances in the study of animal and plant viruses, with particular reference to the latter.

Two Mastigosporium leaf spots on Gramineae, R. Sprague. (U. S. D. A. and Oreg. and Wash. Expt. Stas.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 4, pp. 287–299, figs. 5*).—*M. calvum*, inducing a leaf spot often destructive on *Dactylis glomerata* and on several *Agrostis* species in northwestern Oregon, on *Calamagrostis* spp. in Wisconsin, and also on these grasses in Europe, differs from *M. album*, the cause of a similar disease in Europe, in having muticate 3-septate hyaline spores instead of appendaged ones. The genus is amended to include elliptical, 3- to 5-septate hyaline conidia borne on short, stipitate conidiophores. No evidence was obtained that *M. album* is related to *Dilophospora alopecuri*. *M. album athrix* is assigned to *Septogloeum athrix* n. comb., and its possible relationship to *S. oxysporum* is noted.

The pink patch disease of turf (*New Jersey Stas. Nursery Disease Notes, 11 (1938), No. 2, p. 8*).—A first report of the pink patch disease (*Corticium fuciforme*) for New Jersey.

Some effects of rust infection on the dry weight of host tissues, C. E. Yarwood and J. F. L. Childs. (Univ. Calif.). (*Phytopathology, 28 (1938), No. 10, pp. 723–733*).—The local dry weight per unit area proved greater (average, 33 percent), in rusted than in normal leaf areas in 10 of 11 collections of different rusts, viz, on beet, prune, bean, *Cyperus, Polygonum, Xanthium, Iris*, snapdragon, rose, and sunflower. The rust on poplar was an exception, but the results may be atypical. In 14 tests with paired sunflower leaves or plants the dry weight of the entire infected leaves was 2–46 percent greater than that of the paired controls. In 3 tests the green weight of infected leaves averaged 9 percent and the proportion of dry matter in them 15 percent more than in the healthy leaves. The reductions in dry weights of entire sunflower and bean plants from rust infection of the primary leaves were associated with a higher yield of infected than of healthy leaves, a lower yield of stems from infected than from normal plants, and a lower yield of new growth of infected than of healthy plants. In 1 test with sunflowers and 3 with beans rust infection decreased the diurnal fluctuation in dry weight of leaves.

Studies on the host range of Sclerotium delphinii Welch, D. J. Obee (*Kans. Acad. Sci. Trans., 40 (1937), pp. 89–93, figs. 4*).—Forty previously reported hosts are listed. The results of inoculation trials on 106 plant species indicated only 3 to be completely resistant to the pathogen. Comparisons with the host range of *S. rolfsii* are made.

A method of determining root knot resistance in beans and cowpeas in the seedling stage, K. C. Barrons. (Ala. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 5, pp. 363–370, figs. 2*).—A method said to be satisfactory for beans and cowpeas but not for lima beans was developed for use under controlled greenhouse conditions. A fertile soil previously sterilized and kept constantly moist proved to be a good medium for growing the test seedlings, while the prevalent summer greenhouse temperatures ranging upward from 25° C. were favorable for good root knot development though in the fall artificial soil heat had to be applied. It was experimentally established that in testing pure lines observational ratings of a group of 10 or more plants as a whole are as accurate as ratings of individual plants, and the best time for classification was found to be 20–30 days after planting, depending on the rate of plant growth. The varieties were conveniently separated into five classes on the basis of their root knot resistance, the standard for class 1 being taken as plants grown on nematode-free soil, for class 2 as Alabama Nos. 1 and 2 beans, for class 3 as Conch cowpea, for class 4 as Surecrop Wax bean, and for class 5 as Kentucky Wonder or almost any common bean or cowpea variety.

Varietal resistance of wheat and oats to root rot caused by Fusarium culmorum and Helminthosporium sativum, F. J. Greaney, J. E. Machacek, and C. L. Johnston (*Sci. Agr., 18 (1938), No. 9, pp. 500–523, fig. 1*).—Statistical studies of the disease and yield data of several tests indicated that the disease-rating method of recording the intensity of root rot of wheat by these two fungi gives a reliable index of the amount of field injury. Positive attacks of root rot of wheat and oats were obtained in each of several seasons when *F. culmorum* was introduced into the soil. Wheat germinability was shown to be highest in the varieties and selections most resistant to root rot, and lowest in those most susceptible. All the standard varieties and most of the rust-resistant selections of wheat tested during the investigations proved to be markedly susceptible to root rot by these fungi, but in any given year there were significant differences in reaction among the varieties. Mindum wheat and a few selections of its crosses were most susceptible to root rot, while a few of the new rust-resisant selections, especially Apex and Thatcher, proved to be the most resistant. Extensive varietal tests (1934–36) appeared to indicate that in breeding and selecting for rust resistance some slight progress has been made in securing resistance also to root rot. Varieties most resistant to *F. culmorum* were also fairly consistently resistant to *H. sativum*, while susceptibility to one was significantly associated with susceptibility to the other.

Tests (1934–36) of oat varieties demonstrated a significant variation in the reaction to root rot due to *F. culmorum*. Ohio, Victoria, and the rust-resistant hybrid Hajira × Banner were most resistant, while the standard Victory and Banner varieties were the most susceptible of 10 varieties and selections.

A race of Ustilago avenae capable of infecting Black Mesdag oats, E. K. Vaughan. (Minn. Expt. Sta.). (*Phytopathology, 28 (1938), No. 9, pp. 660, 661*).—Black Mesdag, a variety widely used as a smut-resistant parent in oat breeding, was attacked by loose smut collected in Oklahoma and Kansas. The virulence of the smut collections for the resistant variety was increased by successive inoculations of that variety, owing to the development of an increased proportion of the biotypes capable of developing on it.

Influence of the growth of the host on oat smut development, G. M. Reed (*Amer. Phil. Soc. Proc., 79 (1938), No. 2, pp. 303–326, figs. 6*).—Definite strains of oats, varying in their known reaction to specialized races of *Ustilago avenae* and *U. levis*, when inoculated and grown under varying conditions of light, headed out under artificial light several days to 4 weeks ahead of non-illuminated controls, the plants being shorter and with fewer tillers. Plants supplied with modifications of different nutrient solutions showed marked changes in growth rate, extent of stem elongation, amount of tillering, and also in the time from planting to heading. There appeared to be no definite relation between growth of the host and the ultimate expression of the smut.

Studies on foot- and root-rot of wheat.—VI, Methods of securing infection of wheat seedlings for study in nutrient solutions, W. C. Broadfoot and L. E. Tyner (*Canad. Jour. Res., 16 (1938), No. 6, Sect. C, pp. 253–261*).—Continuing this series (E. S. R., 79, p. 493), the most satisfactory results with the two foot-rot diseases of wheat (*Helminthosporium sativum* and *Fusarium culmorum*) were obtained by first germinating the grains in a specially designed tray, and then securing infection of the seedlings by adding inoculum to the tray, after which the seedlings were transplanted to the nutrient culture solution. Infection was distinctly increased when sucrose was added to the solution before transplanting. It was less satisfactory when the seed was immersed in a spore suspension, dried, and germinated on the tray, and very unsatisfactory following the addition of spore suspension in water (with or without sugar) to the nutrient solution at the time of transplanting. Inoculating the seedlings with a spore suspension by hypodermic needle induced practically no infection. Length of shoot, and especially the dry and green weights of the entire plant, proved to be reliable criteria for evaluating the disease. By the first inoculation method, the degree of infection can be controlled.

Respiration of wheat infected with powdery mildew, R. Pratt (*Science, 88 (1938), No. 2272, pp. 62, 63, fig. 1*).—In this preliminary study, infection of wheat leaves by *Erysiphe graminis tritici* markedly increased the rate of oxygen consumption.

Changes in wheat metabolism caused by powdery mildew, P. J. Allen and D. R. Goddard (*Science, 88 (1938), No. 2278, pp. 192, 193*).—The pathogenesis of *Erysiphe graminis tritici* infection of wheat was correlated with an increase in fermentation and a larger increase in respiration of the host tissue, these changes occurring in the green cells of the mesophyll not in contact with or invaded by the fungus hyphae. Preliminary measurements indicated that the destruction of functional chlorophyll is subsequent to these other metabolic changes.

Black stem rust control in Colorado, E. A. Lungren and L. W. Durrell. (Coop. U. S. D. A.). (*Colorado Sta. Bul. 447 (1938), pp. 18, figs. 10*).—The expressed purpose of this bulletin is to report on the progress made in eradication of rust-spreading barberries in the State, and to point out means by which stem rust losses may be further reduced. It is estimated that during the past 25 yr. the disease has damaged small-grain crops to the extent of 335,000 bu. annually, but the losses have been materially reduced in recent years by barberry eradication and other measures, including selection for seed of rust-resistant varieties and planting of spring wheat as early as the soil can be properly prepared.

Triticum timococcum, the most immune wheat experimentally produced, D. Kostoff (*Chron. Bot., 4 (1938), No. 3, pp. 213, 214*).—An amphidiploid strain of wheat (*T. timopheevi-monococcum*, $n=21$, $2n=42$) produced by the author and called by him *T. timococcum* was grown during 1937 among a world collection of wheats, most of which were severely attacked by various rusts, bunt, mildew, etc., but showed complete immunity against all diseases. Artificial infections with various rusts were unsuccessful. The kernels, larger than those of the parent species, weighed 44.5 g per thousand. Since it appears to be the most immune wheat known, it is the most promising form for breeding immune wheats.

Antagonism of Penicillium spec. versus Pythium debaryanum, A. van Luijk (*Chron. Bot., 4 (1938), No. 3, pp. 210, 211*).—Complete inhibition of *P. debaryanum* attack on alfalfa seedlings was obtained by adding to the soil culture fluid in which *Penicillium* sp. had grown. The thermostable toxic substance was produced most strongly with maltose as carbon source. Saccharose was also satisfactory. Lactose was not. A culture with 4 percent saccharose was toxic to *Pythium* up to 1 part in 1,280, equaling 0.2 percent $HgCl_2$ toward this fungus. The possibility is mentioned of using these toxins for disinfecting soil in pot cultures.

Infection of maize with Phytomonas flaccumfaciens, P. insidiosa, P. michiganensis, P. campestris, P. panici, and P. striafaciens, E. J. Wellhausen (*Phytopathology, 28 (1938), No. 7, pp. 475–482, figs. 2*).—The effects of these organisms on two inbred lines of maize (GB797 very susceptible to *P. stewartii*, and OSF very resistant to it) were determined, a certain degree of infection of very young seedlings of these two lines being obtained with each. Except for *P. insidiosa*, each seemed to attack GB797 more readily than OSF. Infection of either host was primarily confined to the xylem. The degree of stunting, leaf symptoms, and mutilation depended on the spread of the bacteria in the vascular system. In general, leaf symptoms were expressed as a discoloration of affected veins and adjoining parenchyma. No brown, water-soaked lesions, characteristic of infection with *P. stewartii*, were produced by the other organisms. *P. flaccumfaciens* and *P. michiganensis* usually caused a high degree of infection on GB797. A comparatively large number of the xylem vessels throughout the leaves, stem, and mesocotyl of young seedlings were infected. Seedlings were generally severely dwarfed and often a few were killed. *P. insidiosa* had a similar effect on OSF. Infection of the two maize lines by the other organisms was much milder. *P. campestris* and *P. striafaciens* had practically no effect on OSF.

P. stewartii was also tried on the common hosts of some of the organisms here tested on maize. Golden Cluster beans were slightly infected, and Proso millet and Early Pearl oats were readily attacked. No infection on Bonny Best tomatoes or Early Jersey Wakefield cabbage was detected.

The results presented are taken merely to indicate that, of the organisms tried, those closely related to *P. stewartii* in cultural characters are also capable of considerable growth in the medium of the maize plant under conditions most favorable to *P. stewartii*.

Cotton disease investigations [at the United States Field Station, Sacaton, Ariz.], C. J. King, R. E. Beckett, and O. Parker (*U. S. Dept. Agr. Circ. 479 (1938), pp. 29–36, 37, figs. 4*).—Progress reports are included on studies of root rot, including a list of native Arizona plants on which the causal fungus has been found, and control by organic manures and by ammonia and ammonium compounds; and control of the crazy top disorder and of root knot due to *Heterodera marioni*.

Potato diseases in Oregon and their control, M. B. McKay and T. P. Dykstra. (Coop. U. S. D. A.). (*Oregon Sta. Circ. 127 (1938), pp. 84, figs. 61*).—This is a revision of Circular 96 (E. S. R., 63, p. 545) and takes up general control measures, crop rotation, "seed" selection and disinfection, spraying, and storage conditions. Approximately two-thirds of the text follows with respect to specific diseases, and includes those due to parasites, viruses, and climatic or environal conditions. A key to potato diseases is provided.

Microchemical studies of potato tubers affected with blue stem disease, L. M. Hill and C. R. Orton. (W. Va. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 5, pp. 387–392, pls. 7*).—Continuing the studies of this apparently new disease (E. S. R., 78, p. 62), the cellulose and pectic cell walls were found to be partially masked by a suberin deposit in the necrotic regions of the phloem and parenchyma, but when this deposit was dissolved by an oxidizing agent the cellulose walls remained intact. Positive tests for cellulose and lignin were obtained in the necrotic xylem walls. A suberinlike substance detected in necrotic phloem, parenchyma, and xylem gave a positive test for cerin and was soluble in Schultze's reagent. Starch grains were partially or wholly dissolved in the necrotic areas and in the zones, and were replaced by a higher glucose concentration but with no abnormal changes in sucrose content. Protein, tyrosine, and solanine were absent in the necrotic areas and in the zones. Fat was distributed uniformly throughout the healthy tubers as well as in the zone of diseased tubers, but was absent from the necrotic areas. Small amounts of Ca, K, Mg, phosphates, chlorides, and sulfates were found in both normal and diseased tissues. No nitrates were found in the necrotic areas or in the zones, but iron and oxidase were concentrated in the latter. Phenol was detected in the cell walls of the necrotic areas.

The occurrence in the United States of the tuber ring rot and wilt of the potato (Phytomonas sepedonica) (Spickermann u. Kotthoff) Bergey et al., W. H. Burkholder. (Cornell Univ.). (*Amer. Potato Jour., 15 (1938), No. 9, pp. 243–245*).—The author reports the presence in Maine of a type of disease shown by symptoms, culture, and inoculation test to correspond with the "Bakterienringfäule" or bacterial ring rot first reported in Germany by Appel. The pathogen is said to agree well with the various descriptions of *P. sepedonica* and not to be confused with *P. michiganensis*.

Studies of resistance to potato scab in Wisconsin, J. C. Walker, R. H. Larson, and A. R. Albert. (Univ. Wis.). (*Amer. Potato Jour., 15 (1938), No. 9, pp. 246–252, fig. 1*).—The results presented are believed to justify emphasis on the fact that the usually accepted range of resistance among standard varieties does not always hold, three seasons, three soil types, and three geographic locations in Wisconsin having entered into the study. Although the possibility of variation in pathogenicity of strains of the scab organisms with soil type and location is not to be overlooked, it is pointed out that in this study as great differences were observed between seasons at one location as between stations or soil types. It seems to be true that the influence of environal complexes is sufficient to produce widely differing results from season to season, and also that when conditions are not too favorable for the disease the customary range of varietal resistance and susceptibility becomes evident. In the development and testing of new strains it is evident that the influence of environment on severity in the test plat is highly important, and thus a spread of test plats over several localities and soils would seem to be extremely desirable.

A new potato disease in Colorado, C. H. Metzger. (Colo. State Col.). (*Amer. Potato Jour., 15 (1938), No. 8, pp. 225–230*).—An evidently bacterial, internal, slimy, wet rot of tubers and of stems, stolons, and roots below ground is reported for the first time from Colorado as epidemic in overirrigated, heavy loam soils in Montrose County, western Colorado, in 1937, and present in three other districts. Though identification was not yet complete, the disease appeared to be the bacterial wilt due to *Bacterium solanacearum*.

Experiments on the transmission of potato viruses by vectors, T. P. Dykstra and W. C. Whitaker. (U. S. D. A. and Oreg. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 5, pp. 319–334, figs. 5*).—It is demonstrated that four aphids, viz, *Myzus persicae*, *M. solani*, *M. circumflexus*, and *Macrosiphum (Illinoia) solanifolii*, are under certain conditions effective vectors of potato viruses. A much higher percentage of transmission of potato mosaic viruses followed when the aphids had continuous access to both infected and normal plants than when transferred directly from a diseased to a healthy plant. With leaf roll, on the other hand, the direct method gave a high percentage of takes as carried by the first three aphid species, but *Macrosiphum solanifolii* generally failed to transmit by this procedure. Crinkle mosaic (free from X virus) and mild mosaic were transmitted from potato to tobacco by *Myzus circumflexus*, *M. solani*, and *Macrosiphum solanifolii*. Three years' testing of the flea beetle (*Epitrix subcrinata*), tarnished plant bug (*Lygus pratensis*), spittle bug (*Philaenus leucophthalmus*), leafhopper (*Empoasca filamenta*), and *Nabis alternatus* feeding naturally on potato plants, failed to give evidence of transmitting any of the potato viruses tested. The three *Myzus* aphids fed habitually on the phloem, while the *Macrosiphum* fed in the vascular tissues in less than half the cases observed.

Studies on the epidemiology of curly top in southern Idaho, with special reference to sugar beets and weed hosts of the vector Eutettix tenellus, J. M. WALLACE and A. M. MURPHY (*U. S. Dept. Agr., Tech. Bul. 624 (1938), pp. 47, figs. 6*).—Investigation of the reactions of plant hosts, in the desert breeding areas, of *E. tenellus* indicated flixweed (*Sophia parviflora*) and green tansymustard (*S. longipedicellata*) to be important in rendering the leafhoppers viruliferous. Russian thistle (*Salsola pestifer*), the principal summer host in the natural breeding areas, was shown to be susceptible to curly top, but summer populations of leafhoppers on this host failed to maintain a virus supply equal to that of populations in sugar beet fields. The simultaneous percentages of viruliferous leafhoppers in the desert v. cultivated areas was determined by testing them individually on susceptible sugar beet seedlings. It was proved that the virus remains active, both in living plants and in leafhoppers, throughout the winter without apparent change of virulence. The spring-brood leafhoppers moving into cultivated areas gave viruliferous percentages from a low of 4 percent to a high of 67 percent in 6 years' tests. The size of the overwintered population, the prevalence and distribution of weed hosts, and the rate of development of the spring brood, all affect the development of the virus supply in the weeds on which the spring brood develops. However, the type of spring season determines how these factors operate. The spring brood generally becomes more highly viruliferous when the springs are warm and early, but, even so, the virus supply may be restricted by combinations of various factors. The size of leafhopper infestations in beet fields is important from the standpoint of curly top damage, but it is deemed probable that in every season, unless resistant beet varieties are used, the infestation is sufficient to produce serious epidemics provided other factors are favorable. The most important single epidemiological factor is believed to be the stage of beet development at the time of infestation with leafhoppers. Records over 11 yr. indicated 5 yr. of severe curly top damage and consequent low yields. In the 6 yr. of good yields, the movement of leafhoppers into the fields began on or after June 4, while in those of poor yields it began on or before May 24. Thus damage from curly top is less serious when the beets escape exposure during the early seedling stage. Even with the general use of resistant varieties, the stage of development at the time of leafhopper infestation will probably continue to be an important factor in southern Idaho.

Sugar cane diseases in Hawaii, J. P. MARTIN (*Hawaii. Sugar Planters' Sta., 1938, pp. XIV+295, pls. 13, figs. 150*).—In this book the author has attempted to compile the data accumulated at the experiment station over a 30-yr. period, both published and unpublished, so that the information may be more readily available to all interested in the subject, and to describe and illustrate each disease as a guide for identification. Following a general, introductory section, the author takes up in succession the diseases affecting the leaves, leaves and stalk, stalk, and roots. Growth failure and malnutrition, malgrowths, and miscellaneous injuries also receive attention, and for each disease its history, description, cause, transmission (where parasitic), economic importance, and control are discussed.

Chlorotic streak of sugar cane, E. V. Abbott. (U. S. D. A.). (*Sugar Jour., 1 (1938), No. 2, pp. 16, 17, 20, fig. 1; also in Sugar Bul., 16 (1938), No. 20, pp. 4, 5, fig. 1*).—For this disease, believed to be due to a virus and reported for the first time in Louisiana in 1937, the author discusses the appearance and effect on the plant, possible source and present known distribution, importance, how it spreads, and suggested control measures.

A seed-borne disease of sweetclover, F. R. Jones. (U. S. D. A. and Wis. Expt. Sta.). (*Phytopathology, 28 (1938), No. 9, pp. 661, 662*).—*Ascochyta caulicola* was found to be a seed-borne parasite of *Melilotus* spp., limited in its distribution in the United States. It is compared with *A. lethalis* (ascigerous stage, *Mycosphaerella lethalis*).

Sprout and slip treatment of sweet potatoes, T. F. Manns and J. W. Heuberger (*Peninsula Hort. Soc. [Del.] Trans., 50 (1936), pp. 27–31*).—As a result of tests of various chemicals for control of wilt disease and improvement of the set after transplanting, the present recommendations are that seed be produced from slips grown on disease-free land or at least that seed be selected at time of digging, that all seed stock be dug before October 10, that the seedbed soil (clean sand) be changed annually, that seed be treated with $HgCl_2$ (1 oz. to 8 gal.) or organic mercury, that planting be early (May 20 to June 5), and that about 1,000 lb. of 3–8–10 fertilizer be used, with crop rotation sufficient to assist in disease control (not more than three crops in succession).

Varietal susceptibility of tobacco to brown root rot in Canada, L. W. Koch and R. J. Haslam (*Sci. Agr., 18 (1938), No. 10, pp. 561–567, pls. 2, fig. 1*).—Differences in varietal susceptibility of flue-cured and Burley tobacco in Canada are said to be here reported for the first time. Tests (2 yr.) indicated extreme susceptibility of the flue-cured varieties Yellow Mammoth and White Stem Willow Leaf, and considerable resistance in White Mammoth, Bonanza, White Stem Orinoco, and Duquesne. The Burley varieties Harrow Velvet, Gay Yellow, and Halley Special proved highly susceptible, while Judy Pride and Kelley had distinct resistance. Certain Burley varieties most susceptible to black root rot appeared to be most resistant to brown root rot in Canada, and vice versa.

Derivatives from an unusual strain of tobacco-mosaic virus, I. P. Norval (*Phytopathology, 28 (1938), No. 10, pp. 675–692, figs. 7*).—Jensen's J–14, an unusual strain of tobacco-mosaic virus, is low in infectivity and induces local necrotic lesions in Turkish tobacco, but never becomes systemic. Its variants are widely scattered throughout the possible symptom types in tobacco, and include local yellow types, slow-moving yellow types, fast-moving yellow and green types varying in severity, systemic necrotic types, and a strain forming necrotic rings. Twelve distinct strains were found to cause primary and secondary necrosis in tomato, thus resembling J–14 in their ability to destroy tomato tissues. Strains of this type were rarely found in derivatives of the green mosaics. In tobacco and tomato, the ability to destroy tissues seems to be independent of the ability to become systemic, but infectivity is correlated with the ability to move. Many of the mutants, obtained at different times, could not be distinguished symptomatically on Turkish tobacco, tomato, *Nicotiana* *sylvestris*, or *N. glutinosa*. The strains causing necrosis in Turkish tobacco are regarded as having the full complement of factors for necrosis. Strains destroying the tissues of more sensitive plants but not of tobacco are believed to lack some of these factors. By use of a range of host plants differing in sensitivity, it has become possible to recognize within the different virus strains several factors for necrosis.

Isolation and properties of tobacco mosaic and other virus proteins, W. M. Stanley (*Bul. N. Y. Acad. Med.*, *2, ser.*, *14* (*1938*), *No. 7*, *pp. 398–428*, *figs. 8*).—Following a brief historical account, the author discusses the characteristic properties of viruses, selection of tobacco mosaic virus, isolation and properties of the virus protein, correlation of virus activity with protein, double refraction of flow and layering phenomenon, precipitin and anaphylaxis tests, partial reactivation of formolized tobacco mosaic virus protein, summary and discussion of evidence relating to this virus protein, isolation of the virus proteins of the strains of tobacco mosaic virus and of other viruses, and recovery of tobacco ring spot diseased plants. A general discussion of the virus problem terminates the paper.

Phytophthora rot of asparagus in California, P. A. Ark and J. T. Barrett. (Univ. Calif.). (*Phytopathology*, *28* (*1938*), *No. 10*, *pp. 754–756*, *fig. 1*).—The soft rot of asparagus spears found due to a *Phytophthora* and here described appeared to be associated with a period of heavy and prolonged rainfall and perhaps also with the rather common practice of flooding certain areas to induce earlier growth.

Seed transmission of Macrophomina phaseoli, C. F. Andrus. (U. S. D. A.). (*Phytopathology*, *28* (*1938*), *No. 9*, *pp. 620–634*, *figs. 5*).—The occurrence of natural seed transmission of *M. phaseoli* was demonstrated in Henderson bush lima bean seed grown in Georgia, there being ±85 percent in nonsterilized and ±57 percent in surface-sterilized seed. Seed sterilization before planting reduced subsequent seedling infection by ±45 percent. Factors operating during germination seem to be the most important in determining the amount and extent of primary infection. Humidity is a controlling factor in secondary infections of leaves, and prolonged high humidity was necessary to produce symptoms of ashy stem blight on older plants.

Resistance and susceptibility to curly top in varieties of squash, Cucurbita maxima, B. F. Dana. (U. S. D. A. and Oreg. Expt. Sta.). (*Phytopathology*, *28* (*1938*), *No. 9*, *pp. 649–656*, *fig. 1*).—In tests of squash varieties and strains from the United States and abroad at the Umatilla Substation, Oreg., two Marblehead strains known locally as Umatilla and Yakima exhibited outstanding resistance, while all others showed extreme susceptibility to curly-top virus. These resistant strains, apparently originated in the Pacific Northwest, are extremely variable and yet nearly identical in their variation as to shape and color of fruit and seed. The virus caused stunting and death of plants in susceptible squash varieties. Witches' broom and phyllody were associated with curly-top injury when it occurred on the resistant Marblehead.

Two years of study of the effects of root nematode on the yield of canning tomatoes, G. A. Ficht. (Ind. Expt. Sta. et al.). (*Jour. Econ. Ent.*, *31* (*1938*), *No. 4*, *pp. 497–506*, *figs. 2*).—In this study infested and noninfested tomato plants from the South were planted in Indiana (1936–37). During the drought year (1936) there were indications that the number of plants failing to survive setting was increased by nematode infestation, and the number of fruits set was decreased in both seasons. The number of fruits per acre which were ripened and harvested was greater on the noninfested plants of all varieties in both seasons. The size of the fruits of marketable grades was decreased by infestation in practically all cases, and, except for Marglobe (1937), the average size of all grades (by weight) was greater on the normal plants. The fruit yield of marketable grades was decreased by infestation in both years, except for the Pritchard variety (1936). Early blight appeared to be more severe on the nematode-infested plants. Since the yields of marketable fruit were reduced, the per acre value of the crop was also reduced by nematode infestation, and the yields were also probably lowered indirectly as well as directly by the increased prevalence of disease in the infested plats. One year's tests indicated that *Heterodera marioni* is probably incapable of overwintering outdoors in the northern part of Indiana.

Coniosporium disease of apples and crab-apples, J. Dearness and W. R. Foster (*Canad. Jour. Res., 16 (1938), No. 7, Sect. C, pp. 274–276, figs. 4*).—"A new species of *Coniosporium*—*C. mali*—parasitic on the crab apple and several varieties of the common apple, is described. The symptoms of the disease, both on the foliage and the fruit, are similar to those produced by *Fusicladium dendriticum.* Therefore, *Coniosporium* scab is suggested as the common name."

New results with spray materials and methods for control of the more serious apple and peach diseases, J. W. Roberts. (U. S. D. A.). (*Md. State Hort. Soc. Proc., 40 (1938), pp. 4–7*).—A brief summary, with special reference to work by the author and his associates.

Diet disorders of apple trees, A. B. Burrell. (Cornell Univ.). (*Conn. Pomol. Soc. Proc., 46 (1936), pp. 20–29*).—An address summarizing the position of chemical elements (tabulated into groups) in the nutrition of plants, but with special reference to toxicity and deficiency effects on apple trees.

Fruit russet, M. McCown. (Purdue Univ.). (*Ind. Hort. Soc. Trans., 1937, pp. 132, 133*).—Field notes on apple varietal incidence, and on the relation to copper and sulfur sprays.

Apple scab leaf counts, 1937, C. L. Burkholder and R. C. Baines. (Ind. Expt. Sta.). (*Ind. Hort. Soc. Trans., 1937, pp. 133–135*).—Counts are given for different spray preparations and schedules. The value of leaf counts is noted in view of the well-established fact that severe outbreaks of scab are more likely to occur after heavy foliage infection the preceding year. On that basis high counts call for a careful and timely spray schedule.

The control of apple scab without serious injury to foliage, W. D. Mills. (Cornell Univ.). (*Conn. Pomol. Soc. Proc., 47 (1937), pp. 85–95, figs. 3*).—Trees in one orchard receiving the lime-sulfur treatment over a 5-yr. period showed an increased yield due to larger bearing surface and better pollination. This increase was about 3.25 bu. per tree per year with the full lime-sulfur schedule, about 5 bu. with two wettable sulfurs, flotation sulfur and dry-mix, substituted for the summer sprays, and 7.25 bu. with the flotation sulfur for all sprays. Scab control was good with all these materials. In another test including flotation sulfur and Kolofog the differences in yield were not significant, but the latter failed to give as good scab control. In spite of its greater tendency to spray injury and to reduction in yield, the superior effectiveness of lime-sulfur against scab makes its use imperative in certain situations. Liquid lime-sulfur applied only a few minutes before a rain gives protection, and good results are often obtained by spraying immediately after a rain. Wettable sulfurs do not prossess these good qualities. The best type of schedule varies with the orchard, equipment, grower, and season.

Pear scab and its control, L. Childs. (Oreg. Expt. Sta.). (*Oreg. State Hort. Soc. Ann. Rpt., 29 (1937), pp. 25, 27–33*).—This is a general discussion of the disease and its control, with particular reference to Oregon experiences. Properly applied, the dormant spray is said to be an eradicative measure, though not to be relied upon for complete control. Sprays following this are more protective in nature, and in most sections 10–14 days' intervals between applications are productive of satisfactory control. The merits of various sulfur fungicides are also discussed.

Contact periods in graft transmission of peach viruses, L. O. Kunkel (*Phytopathology, 28 (1938), No. 7, pp. 491–497, fig. 1*).—The contact periods found for transmission of the viruses of yellows, little peach, rosette, and mosaic of peach by budding are reported. Mosaic virus usually passed in 2–3, the other viruses in 8–14 days. If transfer of mosaic virus depends on the development of plasmodesmatal connections between diseased and healthy tissues, these connections must, therefore, sometimes be established between mosaicked and healthy tissues within 2 days.

Progress report on investigations of the "X" disease of the peach, E. M. Stoddard. (Conn. [New Haven] Expt. Sta.). (*Conn. Pomol. Soc. Proc., 46 (1936), pp. 15–18*).

Preliminary tests to determine effect of arsenite sprays on sporodochia of Sclerotinia laxa and on control of brown rot in blossoms of almond and apricot, E. E. Wilson and E. F. Serr. (Univ. Calif.). (*Phytopathology, 28 (1938), No. 10, pp. 759, 760*).—Sodium arsenite (1.2 lb. to 100 gal.) treatment of trees before sporodochia appeared had little effect on sporodochial development, but when applied after these structures had appeared this chemical at 1–100 markedly reduced the germinability of conidia borne thereon. When monocalcium arsenite (4–100) plus 4 percent petroleum oil emulsion was applied before the sporodochia appeared, their development was suppressed by 96 percent and the incidence of blossom infection was reduced by 80 percent. Applied after the sporodochia had appeared, this material reduced the germinability of conidia by 97 percent and the incidence of blossom infection by 71 percent. Zinc arsenite (4–100) with or without oil was not so effective in suppressing sporodochium development, but when applied after these structures appeared it reduced the germinability of conidia by 90 percent and the incidence of blossom infection by 83 percent.

Physiological investigations of red raspberry plants inoculated with red raspberry mosaic, B. H. Grigsby (*Michigan Sta. Tech. Bul. 160 (1938), pp. 27, figs. 4*).—Analyses of leaves (Latham variety) for carbohydrate fractions indicated a decrease in simple sugars and starches in the mosaicked and masked over the healthy plants, and an increase in sucrose in mosaicked plants. Total and nitrate nitrogen occurred in lower and ammonia in higher amounts in affected plants, and diastatic activity appeared to be accelerated. As determined by the CO_2 absorption method, photosynthesis was decreased in plants showing marked symptoms, while respiration proceeded at a higher rate in affected tissue whether the symptoms were evident or masked. As determined with standardized hygrometric paper, a higher rate of water loss occurred in the leaves of mosaicked plants, an increase in the stomatal number per unit area accounting for this result. A greater amount of chlorophyll per unit area of leaf was also indicated for affected plants. Ash analyses (spectrographic method) indicated a high amount of silicon, and a greater percentage of ash in the morning- over the evening-collected material. Lower calcium and slightly higher potassium contents were found in the diseased tissues.

Nematode infestation of olive roots, I. J. Condit and W. T. Horne. (Calif. Citrus Expt. Sta.). (*Phytopathology, 28 (1938), No. 10, pp. 756, 757, fig. 1*).—The roots of 10-year-old olive trees in California were found infested with *Pratylenchus musicola*, resulting only in a superficial bark injury rather than a root rot as in fig trees.

Inflorescence blight of the date palm, J. G. Brown and K. D. Butler. (Ariz. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *57* (*1938*), *No. 4, pp. 313–318, pls. 3*).—This blight attacks several varieties and ages of date palms in southern Arizona. Primary infection results in water soaking and discoloration of the infected parts. Flowers may be killed directly or by infection of parts below them. Green fruits decay when sprayed with a spore suspension of either of the fungi concerned. Two species of *Fusarium,* working together or separately, are responsible, viz, *F. moniliforme* and either *F. semitectum* (as identified by Sherbakoff) or *F. lateritium fructigenum* (as indicated by Centraalbureau voor Schimmelcultures). The results of numerous inoculations with the two fungi on different parts of the date palm are given, and a brief description of the histopathology is presented.

The weather in the Salt River Valley, Ariz., at blooming time is usually favorable to infection, hence the general occurrence of the disease. Summer heat, the dryness of autumn, or winter cold failed to injure the fungus. Insects and man are suggested as possible disseminators. Control measures are still in the experimental stage, but removal of all staminate clusters after pollination and of all pistillate rachi after harvest, and early-season spraying, are noted as promising measures.

A preliminary report on the control of leaf chlorosis of grapefruit in Puerto Rico [trans. title], J. H. Jensen (*Rev. Agr. Puerto Rico, 30* (*1938*), *No. 1, pp. 139–143*).—It is concluded that the disease is similar or identical to the one in California known as frenching.

The causes and prevention of tree losses in young filbert orchards, P. W. Miller and C. E. Schuster. (U. S. D. A. and Oreg. Expt. Sta.). (*Oreg. State Hort. Soc. Ann. Rpt., 29* (*1937*), *pp. 191–196; also Oreg. Agr. Col. Ext. Bul. 509* (*1938*), *pp. 8, fig. 1*).—The authors discuss bacterial blight, sunscald, winter injury, drought, poor drainage, rodents, and insects, together with a detailed program of orchard management designed to reduce tree losses.

Studies on walnut blight and its control in Oregon: Seventh report of progress, P. W. Miller. (U. S. D. A. and Oreg. Expt. Sta.). (*Oreg. State Hort. Soc. Ann. Rpt., 29* (*1937*), *pp. 119–143*).—In orchards of uniform variety from grafted stock, spraying with a sufficient number of thorough and properly timed applications of home-made bordeaux mixture resulted in increased yields and very good control of blight due to *Phytomonas* (*Bacterium*) *juglandis* in the critical 1937 season. Applications were made in the early prebloom, late prebloom, and early postbloom stages. The 2–2–50, 2–1–50, and 2–0.5–50 mixtures, respectively, gave almost as good control as the 4–2–50 and 4–4–50 formulas, but were not as effective as 8–5–50 bordeaux. All wetting and adhesive agents used were apparently of little value except a preparation composed of 90 percent sulfonated petroleum hydrocarbons which gave some promise of increasing the efficiency of the spray. The nut set was not adversely affected by bordeaux sprays, but foliage injury followed use of the 2–2–50 formula. High-calcium limes gave more injury than dolomitic or high-magnesium limes. Preliminary results seemed to indicate that bordeaux mixture does not affect the transpiration of walnut leaves as much as that in pecans. The results with other copper sprays are compared.

Gardenia canker control (*New Jersey Stas. Nursery Disease Notes, 11* (*1938*), *No. 3, pp. 9–12*).—A progress report on the canker due to *Phomopsis gardeniae.*

Leaf blight of iris caused by Bacterium tardicrescens, L. McCulloch. (U. S. D. A.). (*Phytopathology, 28* (*1938*), *No. 9, pp. 642–649, figs. 2*).—First observed in 1924, this disease is now known on many if not all bearded irises from Alabama to Massachusetts. *Belamcanda* sp. and other iris types were artificially infected. The leaf lesions, usually elongated streaks, are typically pale yellow, translucent, becoming darker, dry, and shriveled in ordinary weather. With very moist air, the lesions are dark green, translucent, and water-soaked, and may become soft rotted. The disease progresses rather slowly in dry weather, but with moisture it can become very destructive. Leaf bases and rhizomes are unaffected. The bacterium is very susceptible to heat, desiccation, and sunlight, but is resistant to cold, having retained its pathogenicity for 17 mo. in frozen soil thawed at intervals for testing.

The nature of bulb nematode (Ditylenchus dipsaci) populations in "Supreme", "Prince Albert", and "Imperator" iris bulbs, and their control by thermal treatment, R. J. Hastings and J. E. Bosher (*Canad. Jour. Res., 16 (1938), No. 6, Sect. C, pp. 230–233, fig. 1*).—Supreme and Prince Albert, a Dutch *tingitana* hybrid and an English iris, were much more susceptible to infestation than Imperator, a Dutch iris, as judged by the number of nematodes per unit volume of invaded tissue, viz, 596, 108, and 13, respectively. Infestation in the second tended to be confined to the basal plate. Rapid multiplication within the bulb tissue occurred in the first two varieties, while but little took place within the bulb tissue of Imperator. The populations within iris bulb tissue consisted largely of young larvae, in contrast to a high preadult population in narcissus. The low population of the heat-resistant preadults is said to account for the fact that the population in Supreme bulbs can be destroyed by a 60-min. immersion at 110° F., while a 3-hr. immersion is required for narcissus.

Factors influencing the formation of periderm in aspen, F. Kaufert. (Univ. Minn.). (*Amer. Jour. Bot., 24 (1937), No. 1, pp. 24–30, figs. 5; abs. in Minnesota Sta. Rpt. 1937, p. 28*).—Because of the presence of a persistent periderm, the bark of aspen (*Populus tremuloides*) remains permanently smooth unless injured. This study has shown that fungi, lichens, and mechanical injury may stimulate formation of abnormal periderm, with consequent development of rough, fissured bark. *Macrophoma tumefaciens* appears to be the most common cause of rough bark, the mycelium penetrating the periderm layers and stimulating the formation of new layers below those last formed. This fungus appeared to be more prevalent on aspen growing on poor than on good soils.

Inoculation of conifers with the cypress Coryneum, C. O. Smith. (Calif. Citrus Expt. Sta.). (*Phytopathology, 28 (1938), No. 10, pp. 760–762*).—A canker due to *C. cardinale* is reported to have caused injury and death to *Cupressus macrocarpa* trees in California and also to attack other *Cupressus* species in lesser degree. Wound inoculations developed lesions with a radius 15–35 mm. in 2 mo. on *C. arizonica*, *C. bakeri*, *C. duttoni*, *C. forbesi*, *C. glabra*, *C. goveniana*, *C. guadalupensis*, *C. lusitanica*, *C. macnabiana*, *C. macrocarpa*, *C. pygmaea*, *C. sargenti*, *C. sempervirens*, and *C. thurifera*. In 4 mo. the trunks of seedlings 10–17 mm. in diameter were one-half to entirely girdled. Other susceptible species were *Thuja plicata*, *T. orientalis*, *T. occidentalis*, *Librocedrus decurrens*, *Juniperus cedrus*, *J. californica*, and *J. virginiana*. The fungus is parasitic through wounds on many of the Cupressaceae, and especially so on *Cupressus* spp.

Observations on Thyronectria denigrata, C. Lieneman. (Univ. Nebr.). (*Mycologia, 30 (1938), No. 5, pp. 494–511, figs. 47*).—This fungus, on *Gleditsia*, is described from the morphological and developmental standpoints, and its validity as a distinct species is questioned.

Leaf blight of hawthorns (*New Jersey Stas. Nursery Disease Notes, 11 (1938), No. 2, pp. 5–7*).—A note on leaf blight of *Crataegus oxyacantha* due to *Entomosporium thumenii* and found to be generally distributed in New Jersey.

Emendations to the descriptions of Taphrina lethifera and T. aceris on maple (Acer), A. E. Jenkins. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 28 (1938), No. 8, pp. 350–352, figs. 2*).—*T. lethifera* parasitizing leaves of *A. spicatum*, and *T. aceris* leaves of *A. grandidentatum*.

A new species of Taphrina on sugar maple and black maple, A. E. Jenkins. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 28 (1938), No. 8, pp. 353–358, figs. 3*).—Leaf spots of *Acer nigrum* and *A. saccharum* due to *T. sacchari* n. sp.

Annual growth rate of Cronartium ribicola cankers on branches of Pinus monticola in northern Idaho, T. S. Buchanan. (U. S. D. A.). (*Phytopathology, 28 (1938), No. 9, pp. 634–641, fig. 1*).—Field measurements were taken of the proximal growth of *C. ribicola* on branches of *P. monticola* at six representative locations in Idaho (1933–37). Summarizing the 476 measurements secured, it was found that canker growth is greatly influenced by the size of the infected branch, varying (in a straight line) from 1.26 in. per year on branches 0.1 in. in diameter to 2.49 in. on those 1.2 in. in diameter. Besides measuring the growth of typical cankers, it was found that the age and "flagging" had no significant effect on the proximal growth rate. The data are considered of direct application in conducting damage studies on trees up to 30 ft. in height, and they should not result in significant errors when applied to still larger trees of *P. monticola*.

Spread of blister rust to sugar pine in Oregon and California, J. L. Mielke. (U. S. D. A.). (*Jour. Forestry, 36 (1938), No. 7, pp. 695–701, figs. 2*).—Known on the West Coast since 1936, a rather wide spread of *Cronartium ribicola* to *Ribes* occurred in California during 1937, extending southwards for about 125 miles both in the coastal and Sierra Nevada mountains. The present known distribution of this rust in California and Oregon is discussed (with map), together with its behavior on *Pinus lambertiana* which, according to present evidence, is a highly susceptible species.

The development of decay in living trees inoculated with Fomes pinicola, R. R. Hirt and E. J. Eliason (*Jour. Forestry, 36 (1938), No. 7, pp. 705–709, fig. 1*).—One living tree each of *Populus grandidentata, Tsuga canadensis, Picea rubra, Betula lutea, Abies balsamea, Pinus strobus,* and *Fagus grandifolia,* inoculated with mycelia of *Fomes pinicola* isolated from various tree hosts, was felled 10 yr. later, cut into sections, and the development of decay followed. The fungus had demonstrated its ability to cause decay in both coniferous and hardwood hosts regardless of its source, the maximum rot occurring in red spruce, where it extended vertically for ±8 ft.

Studies in wood decay.—VII, How long can wood-destroying fungi endure immersion in water, H. Schmitz and F. Kaufert. (Univ. Minn.). (*Amer. Wood-Preservers' Assoc. Proc., 34 (1938), pp. 83–87*).—Continuing these studies (E. S. R., 78, p. 70), *Trametes serialis, Lentinus lepideus,* and *Lenzites trabea* growing in Norway-pine blocks remained viable after more than 38 weeks' immersion in water, while *Polyporus anceps* was killed in about 6 weeks.

The formation of colored zones by wood-destroying fungi in culture, H. Hopp. (U. S. D. A.). (*Phytopathology, 28 (1938), No. 9, pp. 601–620, figs. 5*).—The colored zones produced in culture by *Fomes applanatus, F. fomentarius, F. igniarius, F. fraxinophilus,* and *Polyporus hispidus* on wood and agar subtrata consisted essentially of swollen, gnarled hyphae associated with a brown pigment secreted by the mycelium. Coloration of the hyaline type of mycelium was induced by experimentally controlling various environal factors in such a way that the hyphae were exposed concurrently to large concentrations of water and air. Atmospheric oxygen was required. Within wood blocks, large concentrations of water and air were present concurrently only in restricted layers, hence the pigmentation usually appeared as zonelines. The physical structure of the substratum and the relative humidity of the air indirectly affected colored-zone formation through their effect on the moisture and air disribution within the blocks.

A study of the pathogenicity of the meadow nematode and associated fungus Cylindrocarpon radicicola Wr., R. J. Hastings and J. E. Bosher (*Canad. Jour. Res., 16 (1938), No. 6, Sect. C, pp. 225–229*).—Isolation of *Pratylenchus pratensis* is reported from root lesions of narcissus, strawberry, apple, cherry, and raspberry in British Columbia. When apparently freed from associated fungi, it reduced the growth of potato, carrot, red clover, spinach, and violet seedlings by 50–75 percent and oat seedlings by less than 4 percent. In parallel tests, the commonly associated *C. radicicola* as a pure culture reduced growth by only 6–11 percent. The growth inhibition by the fungus plus the nematode was usually greater than the sum of the reductions by either alone. The nematodes were separated from the fungi by planting infested oat-root segments in plate cultures of powdered peat moistened with a 0.1 percent malachite green solution, the nematodes migrating through the fungicidal medium to the oats planted therein. The adult and all larval stages proved capable of entering the roots of oat seedlings.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Source book of biological terms, A. L. Melander (*New York: City Col. N. Y., 1937, pp. V+157, figs. 3*).—A work presented in 2 parts, the first, discursive, consisting of 26 chapters, and the second, an alphabetical list of the components of biological vocabulary.

What is the meaning of predation? P. L. Errington. (Iowa Expt. Sta.). (*Smithsn. Inst. Ann. Rpt., 1936, pp. 243–252*).

[Zoology and entomology contributions] (*Utah Acad. Sci., Arts, and Letters, Proc., 14 (1936–37), pp. 99–139, 141–213, figs. 40*).—Contributions presented (E. S. R., 78, p. 511), mostly from the Utah Experiment Station, include: New and Little-Known Utah Diptera, With Notes on the Taxonomy of the Diptera, by S. W. Bromley (pp. 99–109); Biological Control of the Beet Leafhopper in Utah, by G. F. Knowlton (pp. 111–139); Utah Diptera, by G. F. Knowlton and F. C. Harmston (pp. 141–149); Some Potato Insects of Utah, by G. F. Knowlton (pp. 151–154); Notes on Some Utah Lepidoptera, by G. F. Knowlton and M. W. Allen (pp. 155–158); Utah Birds in the Control of Certain Insect Pests (pp. 159–166) and Pea Insects of Utah (pp. 167–169), both by G. F. Knowlton; Grasshopper Survey in Utah, 1936, by C. J. Sorenson and G. F. Knowlton (pp. 171–177); Noctuidae Collected by Light Trap in Central Utah, by E. W. Davis and H. E. Dorst (pp. 179–194); Cormorant and Heron Colonies in Cache Valley, Utah, by J. S. Stanford (p. 195); Extension of Ranges of the Prairie-Dogs of the Genus *Cynomys* in Utah, by R. Hardy (pp. 197, 198); and New Bibionidae (Diptera) From Nearctic America, by D. E. Hardy (pp. 199–213).

A history of land mammals in the Western Hemisphere, W. B. Scott (*New York: Macmillan Co., 1937, rev. ed., pp. XIV+786, [pl.] 1, figs. 420*).—A revised edition of a work, first published in 1913 which has been rewritten throughout, presented in 25 chapters. The illustrations are from photographs and drawings by R. B. Horsfall and C. R. Knight.

Ecological studies on the vertebrate fauna of a 500-acre farm in Kalamazoo County, Michigan, D. L. Allen (*Ecol. Monog., 8 (1938), No. 3, pp. 347–436, figs. 28*).—Report is made of the results of a cooperative effort by the

Michigan State College and the Michigan Department of Conservation made at the W. K. Kellogg Bird Sanctuary, primarily a waterfowl refuge, in Ross Township, Kalamazoo County, containing a lake about 20 acres in area. A check list of the vertebrates observed, arranged by classes, is included.

The American bison, M. S. GARRETSON (*New York: N. Y. Zool. Soc., 1938, pp. XII+254,* [*pls. 49, figs. 7*]).—This account of the American bison (*Bison bison americanus*), presented in 18 chapters, deals particularly with the progress of extermination as a wild species and its restoration under Federal protection

Observations on muskrat damage to corn and other crops in central Iowa, P. L. ERRINGTON. (Iowa Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *57* (*1938*), *No. 6, pp. 415–421*).—In the course of a study of the food habits of the muskrat (*Ondatra zibethica*) in central Iowa over a 4-yr. period extending from the summer of 1934 to the winter of 1937–38 damage to farm crops was found to be confined almost exclusively to corn in fields close to watercourses. The damage recorded was negligible in most cases, but was occasionally severe in small local areas. The value of the pelts of the animals trapped for fur in the area of greatest observed damage was found to exceed the value of the corn destroyed.

Mammals of the Ukr. S. S. R. (data on the fauna), O. O. MIGULIN (*Zviri U. R. S. R.* (*materiali do fauni*). *Kiev: Akad. Nauk U. R. S. R., Inst. Zool. ta Biol., 1938, pp. 422+*[*4*], *figs. 120; Eng. abs., pp. 412–422*).—Eighty-three forms of mammals occurring in the Ukraine are dealt with.

Manual of the vertebrate animals of northeastern and central China, exclusive of birds, C. D. REEVES (*Shanghai: Chung Hwa Book Co., 1933, pp.* [*3*]*+XXXII+806, figs. 169*).—This manual deals with the animals of China found in the area bounded on the north by the Great Wall, west to the longitude of Ichang, and a line from Ichang to Foochow. Keys to orders, families, genera, and species are included in the work.

The tree rat as a pest of cacao in Trinidad, B. G. MONTSERIN (*Port-of-Spain, Trinidad: Govt., 1937, pp. 12,* [*pls.*] *4*).—A preliminary account is given of the arboreal or tree rat, one of the two distinct species of rats which cause injury to cacao in Trinidad, the other appearing to be a ground dweller.

Methyl bromide as a rodenticide, C. E. BERRY (*Calif. Dept. Agr. Bul., 27* (*1938*), *No. 2, pp. 172–180, figs. 5*).—In the experiments conducted methyl bromide proved to be effective in the control of rodents as well as the insects harbored by them. It can be used in wet or dry soils and at various temperatures. There is no danger of fire. It is pointed out that while the present cost is high it can be made use of when follow-up or eradication measures are being carried on and around buildings where there is danger in using treated grain baits. However, further safeguards should be developed before it is made available for general use.

Game birds and game bird shooting, H. B. C. POLLARD (*Boston: Houghton Mifflin Co., 1936, pp. XV+284, pls. 14*).—A practical work presented in 12 chapters, with 6 color plates from water color drawings by P. Rickman and 8 other plates from photographs.

The bird life of Louisiana, H. C. OBERHOLSER. (Coop. U. S. D. A.). (*La. Dept. Conserv. Bul. 28* (*1938*), *pp. XII+834, pls. 45*).—The main part of this work (pp. 25–679) consists of a systematically arranged account of the 430 species and subspecies recorded from the State, not including the 22 forms that are presented in a hypothetical list. Brief accounts of the migration and protection of birds, a calendar of bird migration in the State, and a bibliography of 74 pages are included.

Birds of the Connecticut Valley in Massachusetts, A. C. Bagg and S. A. Eliot, Jr. (*Northampton, Mass.: Hampshire Bookshop, 1937, pp. [12]+LXXIV+[21]+813, [pls. 32, figs. 7]*).—Following the introduction which includes seasonal lists, 367 forms are considered (pp. 1–751). Supplemental data are given in appendix 1 (pp. 753–788) and a historical summary in appendix 2 (pp. 789–802). Indexes to the common names and a colored geographical map are included.

Logbook of Minnesota bird life, 1917–1937, T. S. Roberts (*Minneapolis: Univ. Minn. Press, 1938, pp. VIII+[3]+355, [pl. 1, figs. 22]*).—This work contains bimonthly season reports contributed by the author to *Bird Lore* magazine during a period of 20 yr. It is pointed out that in large measure he acted as a compiler of the observations of other contributors. The information supplements that presented in The Birds of Minnesota (E. S. R., 77, p. 212).

Bird studies at Old Cape May: An ornithology of coastal New Jersey, I, II, W. Stone (*Philadelphia: Del. Val. Ornithol. Club, Acad. Nat. Sci., 1937, vols. 1, pp. XIV+520, pls. [48], [figs. 126]; 2, pp. [1]+521–941, pls. [74], [figs. 85]*).—The studies presented were undertaken with a view to furnishing as accurate a picture as possible of the bird life of Cape May during the decade 1920–30 and include changes that have taken place in the years that followed. The work is illustrated from paintings and drawings by E. L. Poole, R. E. Bishop, C. Roland, J. F. Street, and H. Brown and from photographs.

Midwinter distribution of the American crow in New York State, J. T. Emlen, Jr. (*Ecology, 19 (1938), No. 2, pp. 264–275, figs. 3*).—This contribution brings together information on all the midwinter roosts located within New York State during the 1932–33 season, at which time a total of 225,000 crows were present on 20 wintering territories. It appears that the boundaries of these territories have not changed appreciably in the past half century or more. "There is no evident correlation with any current ecological factor investigated. Territory boundaries coincide more closely with the original distribution of the 'southern hardwood forest' than with existing vegetational cover. The winter range of the crow in New York State may possibly be delimited by an innate 'homing' factor established in the past in the birds of each population unit under primitive ecological conditions, and handed down, essentially unaltered, through the recent decades of extensive habitat change."

The observations made are supplemented with a review of the published literature, of which a list of 28 references is included.

Food habits of Buteo hawks in north-central United States, P. L. Errington and W. J. Breckenridge. (Iowa Expt. Sta.). (*Wilson Bul., 50 (1938), No. 2, pp. 113–121*).—This contribution is based chiefly upon recent studies conducted in Iowa, Minnesota, and Wisconsin of *Buteo* hawks, including particularly the red-tailed hawk (*B. borealis*) and also the red-shouldered hawk (*B. lineatus*), the broad-winged hawk (*B. platypterus*), Swainson's hawk (*B. swainsoni*), and the American rough-legged hawk (*B. lagopus sancti-johannis*).

Conclusions as to the food habits of the barred owl in Iowa, P. L. Errington and M. McDonald. (Iowa Expt. Sta.). (*Iowa Bird Life, 7 (1937), No. 4, pp. 47–49*).—In this brief discussion of observations of the winter, early spring, and summer food of the Iowa barred owl (*Strix varia*), it is pointed out that the nestling young seem to be fed the same sort of food that is eaten by the adult owls, except for very small prey, such as insects, which the adults apparently eat upon capture and rarely carry to the nest. It appears that virtually any animal living in the barred owl's habitat, from insects to the largest vertebrates within its power to kill, may fall victim, observations in Iowa and Wisconsin showing such items of interest as the kingfisher (*Megaceryle alcyon*), bat (*Myotis griscscens*), and small mink (*Mustela vison*). Of the prey species occurring in the barred owl's diet, only the bobwhite (*Colinus virginianus*) has been thoroughly studied from the standpoint of population on the same areas where the barred owl work was done (E. S. R., 75, p. 804). It is pointed out that excess bobwhites are usually eliminated by the far more formidable horned owl or the Cooper's hawk (*Accipter cooperi*), but, in the event of scarcity or absence of these owls and hawks, a compensating elimination seems to take place through the medium of weaker or clumsier predators, the barred owl included.

The European partridge in north-central Iowa, W. E. Green and G. O. Hendrickson. (Iowa Expt. Sta., U. S. D. A., et al.). (*Iowa Bird Life, 8 (1938), No. 2, pp. 18–22, fig. 1*).—This contribution relates to the European partridge (*Perdix perdix perdix* (Linn.)), commonly known as the Hungarian partridge and often called the gray partridge, which was first introduced into Iowa in 1910.

Notes on the food of the California quail in Hawaii, O. H. Swezey (*Hawaii. Ent. Soc. Proc., 9 (1937), No. 3, p. 432*).—The results of an examination of the crops of nine quails killed at Kanoa, Molokai, on November 13 and December 15, 1928, are reported in table form.

The birds of Kenya Colony and the Uganda Protectorate, I–III, F. J. Jackson, completed and edited by W. L. Sclater (*London: Gurney and Jackson, 1938, vols. 1, pp. LII+542, pls. [11], figs. 115; 2, pp. VIII+545–1134, pls. 8, figs. 65; 3, pp. VIII+1137–1592, pls. 6, figs. 61, map 1*).—The introductory part of this work includes a discussion of the geography and of the origin and distribution of the avifauna and a gazetteer of Kenya and Uganda, a brief history of the birds of the Protectorates, and a list of 113 references to the literature dealing with and a key to the orders and suborders of such birds. The subject is then dealt with in systematic order, tables being given to the orders and suborders, families, genera, and species. In addition to references and descriptions, the distribution, recorded localities, and notes are given for the forms recognized, many of which are illustrated by colored plates.

The birds of British Somaliland and the Gulf of Aden: Their life histories, breeding habits, and eggs, I, II, G. Archer and E. M. Godman (*London: Gurney and Jackson, 1937, vols. 1, pp. XCVI+285, pls. [32], [figs. 3]; 2, pp. VII+289–626, pls. [11]*).—In addition to the descriptions of birds here presented, this work includes information on their distribution, life histories, breeding habits, and eggs. A field guide to the identification of the larger nests and a bird nester's calendar appear in appendixes, followed by a bibliography of 56 titles. The work is illustrated by 16 colored plates by A. Thorburn, 4 colored plates by H. Grönvold, and infolded maps of British Somaliland and Ethiopia and adjoining territories.

Some blood parasites from Nebraska birds, II, G. R. Coatney and E. West (*Amer. Midland Nat., 19 (1938), No. 3, pp. 601–612, figs. 12*).—A continuation of this contribution (E. S. R., 78, p. 857), giving descriptions of two new species of *Haemoproteus* and one of *Leucocytozoon* and notes on other forms.

The reptiles of Ohio, R. Conant (*Amer. Midland Nat., 20 (1938), No. 1, pp. 1–200, figs. 113*).—This report is based upon a review of the literature, a five-page list of references to which is included, an examination of collections in leading museums, and field collections and observations commenced in 1930 in the course of which 87 of the 88 counties of the State were covered. It includes an account of the physiography and geography of Ohio, with a distribution list, key to the reptiles of the State, and accounts of the 39 forms recorded (description, range, occurrence in the State, habitat, and habits). Maps of the State indicate the distribution of many of the forms.

Index V to the literature of American economic entomology, January 1, 1930, to December 31, 1934, compiled by M. Colcord, edited by E. P. Felt (*College Park, Md.: Amer. Assoc. Econ. Ent., 1938, pp. [12]+693*).—A continuation of the index previously noted (E. S. R., 64, p. 747).

Index to entomological publications of the Department of Agriculture, 1884–1936, I–III, C. E. Petch (*Ottawa: Canada Dept. Agr., Ent. Branch, 1938, pts. 1, pp. [1]+140; 2, pp. [1]+141–280; 3, pp. [1]+281–410*).—In this index, which contains approximately 4,800 names and 15,000 references, the insects are listed by their scientific names and the synonyms are cross-indexed. The information prefixed to the index includes (1) a list of publications consulted, (2) abbreviations used for the publications reviewed, (3) a bibliography of authors, and (4) a list of authorities with abbreviations.

The influence of constant and alternating temperatures on the development of certain stages of insects, T. Ahmad (*Natl. Inst. Sci. India Proc., 2 (1936), No. 2, pp. 67–91, figs. 7*).—In a study made of the development of *Locusta migratoria migratorioides* eggs at 100 percent relative humidity and constant temperatures ranging from 20° to 37° C., the threshold of development was found to be 17° and the optimum range of development between 33° and 37°. "With daily alternation of 5° and 27°, 30°, or 37°, significant acceleration of development amounting to 19 hr., 12 hr., and 3.6 hr., respectively, is produced. A single exposure of 1–4 days to 5° at the beginning of embryonic development also produces an acceleration, with a maximum of 17 hr. when the temperature of incubation is 27°. Exposure to 5°, after 50 percent development has occurred, results in retardation of development and lowering of viability.

"The pupal development of *Calliphora erythrocephala* and *Muscina stabulans* is influenced mainly by temperature and to a small extent by saturation deficiency. The development as well as viability are optimum at saturation deficiency of 9 mm in the former and 3 mm in the latter insect. Alternating temperatures accelerate the development of *C. erythrocephala* pupae. Acceleration in pupae exposed to 5° for 8 days and then kept at 14.8°, 18.4°, and 23° is 2.12 days, 1.46 days, and 0.85 day, respectively. Daily alternation produces greater acceleration than a single prolonged exposure. Comparatively little acceleration is obtained by the fluctuation of any of the temperatures employed in the case of *M. stabulans* pupae."

[Contributions on insect control] (*Peninsula Hort. Soc. [Del.] Trans., 51 (1937), pp. 111–126, 131–139, figs. 3*).—Contributions on insect control presented at the annual meeting of the Peninsula Horticultural Society held at Camden, Del., in December 1937 are: Factors Underlying Codling Moth Control Under Heavy Infestation Conditions—Satisfactory Procedure, by T. J. Headlee (pp. 111–116) (N. J. Expt. Stas.); Suggestions for Improved Codling Moth Control Based on Experience in Indiana, by J. M. Amos (pp. 117–119), Comments on the Control of Several Fruit and Vegetable Insects, by L. A. Stearns (pp. 120–126), and Cat-Facing of Peaches by the Tarnished Plant Bug (*Lygus pratensis* (L.)), by P. L. Rice (pp. 131–136) (all Del.); and The Japanese Beetle Retardation Program in Maryland for 1938, by S. L. Crosthwait (pp. 137–139).

[Contributions on economic insects and their control] (*Md. State Hort. Soc. Proc., 40 (1938), pp. 10–13, 27–34*).—These contributions include the following: Dormant Sprays, by W. S. Hough (pp. 10–13) (Va. Expt. Sta.), and The Codling Moth Population in Maryland, 1937, by C. Graham (pp. 27, 28), and The Program for Japanese Beetle Retardation in Maryland During 1938, by G. S. Langford (pp. 28–34) (both Md. Univ.).

Insects of Indiana for 1936, J. J. Davis. (Ind. Expt. Sta.). (*Ind. Acad. Sci. Proc., 52 (1936), pp. 230–239*).—The usual annual report (E. S. R., 76, p. 501).

Entomology, S. Marcovitch (*Tennessee Sta. Rpt. 1937, pp. 32–34*).—The work of the year reported (E. S. R., 77, p. 360) relates to cryolite spray residues (E. S. R., 80, p. 71), control of the corn earworm as a pest of tomato, sprays for the Mexican bean beetle, and the more important insect pests of the year (including the New York weevil, the red-legged grasshopper, the blister beetle *Epicauta lemniscata*, and the tobacco flea beetle).

Recommendations for codling moth and mite control in Washington for 1938. (Wash. Expt. Sta., U. S. D. A., et al.). (*Better Fruit, 32 (1938), No. 9, pp. 3, 4, 5, 10, 11*).—Recommendations for 1938 (E. S. R., 77, p. 658) are presented.

Sixty-seventh annual report of the Entomological Society of Ontario, 1936 (*Ent. Soc. Ontario, Ann. Rpt., 67 (1936), pp. 91, figs. 12*).—Contributions in this report, some of which are continuations (E. S. R., 78, p. 512), include the following: Developments in Vacuum Fumigation at the Port of Montreal, by L. S. McLaine and H. A. U. Munro (pp. 15–17); The Agricultural Pests' Control Act, 1927, With Regulations, by G. E. Grattan (pp. 18–20); Pyrethrum and Derris Dust, by A. Kelsall and H. T. Stultz (pp. 20–29); A Laboratory Apparatus for Determining the Relative Toxicity of Contact Dusts, by S. H. Payne and H. T. Stultz (pp. 30–33); The European Corn Borer in Ontario in 1936, by L. Caesar (pp. 33–35) (E. S. R., 78, p. 512); The Sweet Clover Weevil [*Sitona cylindricollis* F.], by H. W. Goble (pp. 35–37); A Report on the Alfalfa Snout Beetle (*Brachyrhinus ligustici* L.) in New York, by C. E. Palm (pp. 37–40); Resistance of Some Varieties of Peas to the Pea Aphid (*Illinoia pisi* Kalt.), by J. B. Maltais (pp. 40–45); Observations on the Biology of the Apple Maggot, by J. A. Hall (pp. 46–53); Results From Organized Apple Maggot Control in Nova Scotia, by A. Kelsall and A. D. Pickett (pp. 53–55); Notes on the European Pine Shoot Moth (*Rhyacionia buoliana* Schiff.), by A. H. McAndrews (pp. 56, 57); Four Years' Experience With "Electracide" Light Traps, by D. F. Patterson (pp. 57–61); A Brief Report on Certain Mercury Salts Used Experimentally Against the Onion Maggot, by A. G. Dustan (pp. 62, 63); Some Factors in the Control of the Common Greenhouse Aphid *Myzus persicae* Sulzer [the Green Peach Aphid] by the Parasite *Aphidius phorodontes* Ashm., by J. H. McLeod (pp. 63, 64); The Grasshopper Outbreak in Ontario in 1936, by H. A. Gilbert and R. W. Thompson (pp. 65–68); A Note on the Grasshopper Situation in Manitoba in 1936, by A. V. Mitchener (pp. 68, 69); Observations on the Life-History and Habits of the Columbine Borer, by W. G. Matthewman (pp. 69–72); Invasion of Three New Quebec Districts by the Potato Beetle, by G. Maheux (pp. 72, 73); and A Summary of the Insect Pest Situation in Canada in 1936, by C. R. Twinn (pp. 73–87).

Entomology, C. E. Pemberton (*Hawaii. Sugar Planters' Assoc. Proc., 57 (1937), Expt. Sta. Com. Rpt., pp. 20–27*).—This report for the year ended September 1937 relates to the work with the oriental beetle, the New Guinea sugarcane weevil, the asparagus miner (not hitherto known in Hawaii), the introduction of Guam ladybeetles (*Coccinella arcuata* and *Cryptogonus nigripennis*), the classification of the Koebele collection of ladybeetles, the Guam insect survey, the pepper weevil parasite *Cerambycobius cushmani*, etc.

An improved method for testing liquid contact insecticides in the laboratory, H. J. Craufurd-Benson (*Bul. Ent. Res., 29 (1938), No. 1, pp. 41–56, pl. 1, figs. 7*).—The author presents a review of methods for laboratory testing of contact insecticides and points out some of their disadvantages. A detailed account is then given of an improved immersion method for laboratory testing of such insecticides.

The selection of a standard insect for the laboratory testing of insecticides, H. J. Craufurd-Benson (*Bul. Ent. Res., 29 (1938), No. 2, pp. 119–123*).—In continuation of the above an account is given of the standards adopted by the author for a test insect suitable for the laboratory testing of insecticides. The inadvisability of using insects collected in the field, or insects that do not breed naturally throughout the year, is illustrated. The results of a search among stored-product insects, involving the testing of 27 different species, are given. *Ahasverus advena*, the saw-toothed grain beetle, and *Oryzaephilus mercator* have been found to be suitable laboratory test insects. A table reporting the susceptibility of 27 species of stored-product insects to derris insecticides is included.

Further experiments with inverted or "dynamite" spray mixtures, J. Marshall and K. Groves. (Wash. Expt. Sta.). (*Better Fruit, 32 (1938), No. 8, pp. 3–7*).—Some additional work with inverted mixtures (E. S. R., 78, pp. 364, 368) is reported.

Substitute spray materials, S. A. McCrory and C. G. Vinson (*Missouri Sta. Res. Bul. 292 (1938), pp. 11*).—In the work reported attempts were made to fix nicotine sulfate with bentonite for a period of time sufficiently long to make it effective as a spray in codling moth control. "Due to the light infestation, the protection against codling moth was not conclusive evidence. The nicotine sulfate-bentonite (dry-mix) combination, especially when some sticking and spreading agent was used, gave good protection against codling moth, even when the lead arsenate calyx spray was omitted. The lead and arsenic trioxide carried in the residue at harvest were well below the respective tolerance limits. Black Leaf 155 did not give a very noticeable residue on the fruit and foliage, neither did dry-mix nicotine-bentonite preparation. So conspicuous was the residue on the fruit and foliage when sprayed with nicotine sulfate-bentonite (wet-mix) as to make brushing or washing of fruit necessary. Magnesium sulfate, as it was applied, was ineffective in the control of codling moth and Colorado potato beetles but seemed more effective in the control of corn earworms. Paradichlorobenzene and beta-naphthol emulsions were applied to codling moth in the cocoon stage. Larvae in the cocoons were alive after 10 days' exposure. These materials were too injurious to growing plant tissue to be used as spray materials."

Dormant sprays for Virginia orchards, W. S. Hough. (Va. Expt. Sta.). (*Va. State Hort. Soc. Rpt., 42 (1937), pp. 134–138*).

Insecticides and fungicides, 1918–38, R. C. Roark (*Chem. Indus., 42 (1938), No. 6, pp. 636, 637, 639*).—A brief discussion of important developments in insecticides and fungicides during the past two decades which includes a tabulated estimate of the United States consumption of insecticides and fungicides in 1936.

Ohio wheat field insect survey for 1938, T. H. Parks (*Ohio Sta. Bimo. Bul. 194 (1938), pp. 172–174, figs. 2*).—The findings in the annual wheat field insect survey (E. S. R., 78, p. 363) have shown the hessian fly to have made a noticeable increase in population, especially in the northwestern section of the State, although it failed to take a serious toll from the year's wheat crop. Made just before the harvest of the crop, the survey revealed an increase over the preceding year in 26 of the 34 counties visited, the average percentage of straws infested throughout the State being 10 as compared with 4.3 in 1937. Maps are given indicating the percentage of wheat straws infested with the hessian fly in the counties visited and the hessian fly safe-sowing dates, the importance of a general observance of such sowing dates being emphasized.

Insect fauna of Gossypium tomentosum, O. H. Swezey (*Hawaii. Ent. Soc. Proc., 9 (1935), No. 1, pp. 96–98*).—An annotated list of the insects taken on the native species of cotton grown in the dry lowland regions of Oahu and Molokai of the Hawaiian Islands.

Potato insect years, L. B. Daniels. (Colo. Expt. Sta.). (*Nebr. Potato Impr. Assoc. Ann. Rpt., 18 (1937), pp. 24, 25*).—Considerable data on potato insects are said to have been accumulated during the past few years which make it quite plain that there are so-called psyllid years, flea beetle years, and Colorado potato beetle years. By assembling weather data, correlating psyllid and flea beetle abundance, and making the two annual summer surveys it has been possible to draw conclusions as to the probable conditions necessary for a bad potato insect year.

Tolerance of certain potato varieties to psyllid yellows, M. F. Babb and J. E. Kraus. (U. S. D. A.). (*Nebr. Potato Impr. Assoc. Ann. Rpt., 18 (1937), pp. 26–30*).—In a test conducted at Cheyenne, Wyo., none of the 39 varieties of potatoes was found immune to psyllid yellows. This finding is said to have been supported by a planting immediately adjacent to the test plats in which about 182 varieties were grown. It appears reasonably certain that there are inherent differences between varieties in their tolerance to psyllid yellows.

The results of the attempt made to evaluate the seriousness of the infection to tops and tubers and data covering the relation between yield and earliness to psyllid injury are presented in detail in table form.

Notes on potato insects in Hawaii, O. H. Swezey (*Hawaii. Ent. Soc. Proc., 9 (1937), No. 3, pp. 433–435*).—Notes are presented on 11 insect forms found attacking leaves and tubers of the potato, the raising venture of which crop on a large scale on fallow cane lands in Oahu is said to have proved successful.

Report of experiments with vegetable insects, 1936, W. E. Britton (*Conn. Veg. Growers' Assoc. Rpt., 1936, pp. 48–50*).—This is a brief progress report of experiments conducted during the year 1936 with the potato flea beetle, European corn borer, corn earworm, onion thrips, squash bug, and Japanese beetle.

[Contributions on vegetable insects in Connecticut] (*Conn. Veg. Growers' Assoc. Rpt., 1937, pp. 34–37*).—These contributions were presented at the annual meeting of the association held in December 1937, as follows: Report of Experiments With Vegetable Insects in 1937 (pp. 34, 35), and Vegetable Insects in Connecticut in 1937 (pp. 36, 37), both by W. E. Britton.

Control of cabbage insects, H. G. Walker and L. D. Anderson. (Va. Truck Expt. Sta.). (*Va. Acad. Sci. Proc., 1937, p. 41*).—Brief reference is made to the progress of work with cabbage insects (E. S. R., 77, p. 819). Dipping plants infested with the cabbage aphid in nicotine-soap and pyrethrum extract-soap solutions before transplanting them in the field is said to have given good control of this pest without injury to the plants. A 3 percent nicotine-hydrated lime dust has given good control of this pest in the seedbed and in the field. Derris dusts and sprays have given promising results when used for the control of the harlequin bug.

Fruit-eating and seed-eating insects in Hawaii, O. H. Swezey (*Hawaii. Ent. Soc. Proc., 9 (1936), No. 2, pp. 196–202*).—An annotated list, arranged by systematic orders of insects, of which the Lepidoptera represent by far the largest number, is presented.

Wet weather and fruit insects, W. J. Schoene. (Va. Expt. Sta.). (*Va. Fruit, 26 (1938), No. 7, p. 18*).

[Contributions on orchard insect control] (*Ill. State Hort. Soc. Trans., 71 (1937), pp. 177–183, 226–233, 355–362, 392–404, 418–432*).—These contributions (E. S. R., 77, p. 658) include the following: The Cost of Codling Moth Control, by W. P. Flint, S. C. Chandler, and M. D. Farrar (pp. 177–182) (Ill. Expt. Sta.); Effect of Non-arsenical Sprays on Apple Trees, by F. Chatten (pp. 226, 227); Results Obtained From Nicotine Sprays, 1937, by M. P. Reed (pp. 228–230); Controlling Codling Moth With Heavy Lead Sprays, by H. Hale (pp. 231–233); Leafhopper Control in Orchards, by M. D. Farrar (pp. 355–359); Pruning and Spraying Practices Which Affect Codling Moth Control in Indiana, by C. L. Burkholder (pp. 392–399) (Ind.); and Codling Moth Control Without the Use of Lead Arsenate, by W. P. Flint and S. C. Chandler (pp. 418–424), and Results of Peach Insect Control Work in 1937, by S. C. Chandler and W. P. Flint (pp. 427–432) (both Ill.).

Insects of the blackberry, raspberry, strawberry, currant, and gooseberry, A. J. Hanson and R. L. Webster (*Washington Sta. Pop. Bul. 155 (1938), pp. 38, figs. 27*).—This practical account of certain insect and mite pests in the Puget Sound region deals with 2 important insect enemies of the blackberry, 10 of the raspberry, 13 of the strawberry, and 4 of the currant and gooseberry and includes a description of the characteristic injury, life history, and means of control for each of these several pests. A list of additional species recorded from strawberries, blackberries, and raspberries is included.

Insects of citrus and other subtropical fruits, H. J. Quayle (*Ithaca, N. Y.: Comstock Pub. Co., 1938, pp. IX+583, figs. [379]*).—This work, based upon observations and studies in California extending over a long period of years, a 3 yr. study outside of the United States of citrus insects in the more important regions of the world, and a review of the literature, references to which are included, is presented in 18 chapters. Following a discussion of subtropical fruits and the important insects, or groups of insects, that attack them, together with a key to the principal citrus fruit insects and mites in the United States, the several chapters deal with major insects and mites that attack citrus fruits, predaceous and parasitic insects that attack citrus and other subtropical fruit pests, minor insects and mites that attack citrus fruits, insects and mites that attack the avocado (pp. 342–352), the vinifera grape (pp. 353–370), the Persian walnut (pp. 371–393), the almond (pp. 394–396), the fig (pp. 403–416), and the date (pp. 422–429), insects that attack the pecan (pp. 397–402), the olive (pp. 417–421), and the oriental persimmon, pomegranate, and sweet cherry (pp. 430–434), and rodents, nematodes, and snails that attack citrus and other subtropical fruit trees (pp. 435–445). Chapters on fumigation (pp. 446–512), spraying and dusting (pp. 513–547), and domestic plant quarantines that pertain to subtropical fruit insects (pp. 548–558) are included.

Important pecan insects of northern Florida, S. O. Hill. (U. S. D. A. and Fla. Expt. Sta.). (*Fla. Ent., 21 (1938), No. 1, pp. 9–13*).—A practical account of the insects of importance in the Monticello pecan-growing section of northern Florida.

Insect and other animal pests of Dianthus, W. E. Blauvelt (In *The Garden of Pinks*, L. H. Bailey. *New York: Macmillan Co., 1938, pp. 48–61, figs. 5*).—This practical account deals with insect and related pests of *Dianthus* (garden pink), of which the common red spider, several species of thrips, and aphids are of major importance, and the cabbage looper, corn earworm, cutworms, and slugs are occasionally very injurious.

Some forest entomological methods and conceptions, I. Trägårdh and V. Butovitsch (*Bul. Ent. Res., 29 (1938), No. 2, pp. 191–210, figs. 11*).—The results achieved through accurate and time-saving methods devised in Sweden of estimating the number of bark beetles breeding in a trunk as well as the total number per hectare in a given instance are considered. The strip survey method, trap trees, and calculation of the number of trap trees are taken up, the details being given in 11 figures.

Survey of the wood-destroying insects in public buildings in Sweden, I. TRÄGÅRDH (*Bul. Ent. Res., 29 (1938), No. 1, pp. 57–62, figs. 3*).—A contribution from the Royal Swedish Institute of Experimental Forestry.

Medical entomology: A survey of insects and allied forms which affect the health of man and animals, W. A. RILEY and O. A. JOHANNSEN (*New York and London: McGraw-Hill Book Co., 1938, 2. ed.,* [*rev.*], *pp. XIII+483,* [*pl. 1*], *figs. 184*).—A revised edition of this work (E. S. R., 67, p. 566), which includes a supplementary bibliography of six pages.

A treatise on medical and veterinary entomology, M. NEVEU-LEMAIRE (*Traité d'entomologie médicale et vétérinaire. Paris: Vigot Bros., 1938, pp. XXVII+1339, figs.* [*598*]).—This work, systematically arranged, is presented in four parts, namely, general entomology (pp. 1–110), special entomology (pp. 111–1213), hosts of arthropod parasites and commensals (pp. 1215–1246), and parasites and germ pathogens of which the arthropods are the immediate hosts or their vectors (pp. 1247–1288).

The entomologist and human health, S. MARCOVITCH. (Tenn. Expt. Sta.). (*Sci. Mo., 46 (1938), No. 6, pp. 526–528*).—A practical discussion.

What termite menace? N. TURNER. (Conn. [New Haven] Expt. Sta.). (*Soap, 13 (1937), No. 12, pp. 119, 121*).—A practical contribution.

Man and the termite, H. NOYES (*London: Peter Davies, 1937, pp. XIV+289,* [*pls. 8*]).—A practical account presented in 26 chapters, with a bibliography of 4 pages.

Toxic and repellent properties of some inorganic and organic compounds and mixtures in grasshopper baits, C. H. RICHARDSON and E. J. SEIFERLE. (Iowa Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *57 (1938), No. 6, pp. 423–432*).—In the experiments conducted in Iowa during the summer of 1937, 110 inorganic and organic substances were fed individually in bran-water baits to adult lesser migratory grasshoppers (*Melanoplus mexicanus mexicanus* Sauss.) the chemical substance constituting 1 percent by weight of the moist bait. The insects were allowed to feed ad libitum on the bait mixture and the net mean mortality within 72 hr., mean survival time in hours, mean bait consumption in grams, mean feeding time in minutes, and mean quantity of chemical substance consumed with the bait in milligrams per gram of body weight of the insect recorded, the details being given in table form.

The lethal compounds are grouped as follows: (1) Highly toxic compounds (93- to 100-percent mortality)—zinc phosphide, ammonium fluoride, ammonium bifluoride, potassium fluoride, arsenic trioxide, sodium arsenite, and zinc arsenite; (2) moderately toxic compounds (77-percent mortality)—arsanilic acid and thallous sulfate; (3) slightly toxic compounds (15- to 20-percent mortality)—crystal violet, diphenyl, and mercurous chloride. The three fluorides gave the shortest survival times, zinc phosphide was intermediate with 22 hr., and the remaining lethal compounds ranged from 31 to 47 hr. Highest bait consumption in the lethal group was given by zinc phosphide, lowest by sodium arsenite and zinc arsenite. The insects fed longest on baits containing zinc phosphide, but only a brief period on the ammonium bifluoride and sodium arsenite baits. Sodium arsenite is outstanding in the small quantity of poison relative to body weight required for high toxicity.

"The nontoxic substances varied greatly in their effect on bait consumption and feeding time. Consumption was greatest of baits containing magnesium carbonate, sodium benzoate, zinc cyanamide, barium fluoride, and chromic oxide, and smallest of baits containing a rather large group of compounds among which were most of the copper compounds and many of the phenols used in these tests. Feeding time was abnormally long, or equal to that on the bran-water standard, on compounds that showed high bait consumption; but it was also very long on some chemicals that were consumed in normal quantities. Some of these long feeding times may have resulted from the effect of the compound on the texture or other physical property of the bait. All the cadmium and magnesium compounds were ineffective except magnesium sulfate, which was repellent at the enormous concentration of 35 percent. The insoluble fluorides of barium, calcium, and magnesium were nontoxic. Mercuric chloride was so repellent that little of the bait containing it was eaten.

"Sodium arsenite and diphenyl are probably more toxic to the males than to the females.

"If undisturbed, this grasshopper consumes about 0.10 g of a nontoxic bran-water bait per gram of body weight, or 10 percent of its weight at one feeding."

A list of 11 references to the literature is included.

The locust outbreak in Africa and western Asia in 1935 [and 1936], B. P. Uvarov and W. Milnthorpe (*London: Econ. Advisory Council, Com. Locust Control, 1937, pp. 63, pls. 9; pp. 55, pls. 9*).—These reports (E. S. R., 74, p. 232) deal with the desert locust *Schistocerca gregaria* (Forsk.), the African migratory locust *Locusta migratoria migratorioides* (R. & F.), and the red locust *Nomadacris septemfasciata* (Serv.), their distribution being illustrated by nine detached maps. Each report is accompanied by an appendix giving a bibliography of the literature on locusts and grasshoppers and their control. That for 1935 also contains appendixes dealing with (1) an outbreak of the migratory locust in Palestine and (2) an incipient outbreak of the red locust in Madagascar, while the 1936 report has an appendix showing the occurrence of locusts in British North Borneo during 1936.

Wing and pronotum length in grouse locusts, R. K. Nabours and N. R. MacQueen. (Kans. Expt. Sta.). (*Genetics, 23 (1938), No. 1, p. 161*).—An abstract.

A survey of host ranges of thrips in and around Hawaiian pineapple fields, K. Sakimura (*Hawaii. Ent. Soc. Proc., 9 (1937), No. 3, pp. 415–427*).—Included are tables giving (1) host ranges of thrips in and around Hawaiian pineapple fields and records of their distribution, (2) the known thrips vectors and virus diseases, and (3) species and populations of thrips associated with the susceptible plants of yellow spot virus. A list of 22 references to the literature is included.

Biological studies on the leafhopper Empoasca fabae as a bean pest, D. M. DeLong (*U. S. Dept. Agr., Tech. Bul. 618 (1938), pp. 60, figs. 41*).—Studies of the biologic, ecologic, and economic phases of the potato leafhopper problem as relates to the bean, with special reference to the Ohio area, and conducted over a period of several years, are summarized. Although primarily a low-altitude, humid-climate species, this leafhopper occurs in but small numbers in the low-altitude areas of the Pacific coast where rainfall is scarce. In order for it to build economic populations it is apparently necessary that there should be several inches of rainfall during the growing season. Feeding upon a variety of cultivated host plants, it may cause several types of injury, such as hopperburn on potato, eggplant, dahlia, and rhubarb; stunting, dwarfing, and rosette formation on beans; and pigmentation on alfalfa and clover.

Observations indicate that it passes the winter in some southern breeding ground and spreads north in the spring of the year. In Ohio it appears in the field about the middle of June. From two to three eggs per day per female were produced, the fluctuation being caused by variations in temperature. When mating occurs normally the preoviposition period is from 3 to 5 days in duration. Nymphal development also varies with temperature. The average time for development during 1926 was 12.9 days, in 1927 it was 15.4 days, and in 1928 it was 12.3 days. During the 3 yr. of study four distinct broods were produced upon bean each season. The first was complete, the second practically complete, and the third and fourth were partial generations only. Records showed longevity averages of from 30 to 40 days for all females during the three seasons. The longest record obtained was that of a female that lived 92 days after capture in the field.

A list of 60 references to the literature is included.

Notes on the taro leafhopper Megamelus proserpina Kirk. (Delphacidae), D. T. FULLAWAY (*Hawaii. Ent. Soc. Proc., 9 (1937), No. 3, pp. 405, 406*).—This destructive delphacid leafhopper which was believed to have been eradicated at Waianae in 1930 is said to have reappeared and to be doing considerable damage to the taro planted in Honolulu. Being apparently confined to a very small acreage, eradication will again be attempted.

Pyrethrum and leafhopper dusting, C. A. DOEHLERT. (N. J. Expt. Stas.). (*Amer. Cranberry Growers' Assoc., Proc. Ann. Mtg., 68 (1938), pp. 25–28*).—Further use of pyrethrum in leafhopper control on cranberry bogs gave good kills, thus confirming earlier work (E. S. R., 78, p. 822).

New materials for leafhopper dusting, C. A. DOEHLERT. (N. J. Expt. Stas.). (*Cranberries, 2 (1937), No. 8, pp. 6, 11*).—The results here presented have been noted from another source (E. S. R., 78, p. 822).

The aphid genus Flabellomicrosiphum in Utah, C. F. SMITH. (Utah Expt. Sta.). (*Pan-Pacific Ent., 13 (1937), No. 3, pp. 127–129, fig. 1*).—A new species, *F. knowltoni*, from *Artemisia tridentata* near Logan, Utah, is described.

Generic check list of aphids and phylloxera, F. W. MILLER (*Amer. Midland Nat., 19 (1938), No. 3, pp. 658–672*).—A check list of all the generic names of aphids and phylloxera, in the compilation of which original papers were consulted so far as were available.

The greenhouse white fly: Control by the parasite Encarsia formosa, N. S. NOBLE (*Agr. Gaz. N. S. Wales, 49 (1938), No. 5, pp. 253–255, 287, figs. 3*).—A more detailed account of the breeding and liberation of the greenhouse white fly parasite *E. formosa* than that by Tonnoir (E. S. R., 78, p. 823).

Serological differentiation of citrus red scale (Aonidiella aurantii) and citrus yellow scale A. citrina, F. R. BUSHNELL and L. J. KLOTZ (*Phytopathology, 28 (1938), No. 9, p. 669*).—An abstract of a contribution presented at a meeting held in San Diego, Calif., in June 1938 in which the authors report having found it possible to distinguish between the California red scale and *A. citrina* through application of the precipitin test.

Some observations on the behavior of the periodical cicada (Magicicada septendecim L.), H. A. ALLARD (*Amer. Nat., 71 (1937), No. 737, pp. 588–604, fig. 1*).—Observations of the periodical cicada in 1936 during the great emergence of brood X in Arlington County and elsewhere in Virginia are reported.

The use of bait traps in codling moth control, M. L. BOBB. (Va. Expt. Sta.). (*Va. Fruit, 26 (1938), No. 4, pp. 20, 22, 24*).—In this report upon the capture of codling moths in traps at different heights in the orchard and the number captured by the most promising attractants during 1936 and 1937, it is pointed out that, while the value of bait traps in reducing the number of moths in the orchard is still in the experimental stage, the results of tests with many bait-trap attractants in the Crozet section during the past 3 yr. have been encouraging, with several materials giving promise as an aid in codling moth control.

Developments in the spray program for codling moth control, W. S. Hough. (Va. Expt. Sta.). (*Amer. Pomol. Soc. Proc., 52 (1936), pp. 223-226*).—This contribution has been noted from another source (E. S. R., 78, p. 514).

Analysis of fluctuations in the activity of insects: A study on the European corn borer (Pyrausta nubilalis Hubn.), G. Beall (*Canad. Jour. Res., 16 (1938), No. 3, Sect. D, pp. 39–71, figs. 5*).—The fluctuations in the activity of the European corn borer are reported upon in this contribution from the Dominion Department of Agriculture.

Drought damaged poplars attacked by the spotted tree borer Synaphaeta guexi (Lec.), A. E. Michelbacher and E. S. Ross. (Univ. Calif.). (*Calif. Dept. Agr. Bul., 27 (1938), No. 2, pp. 248, 249, fig. 1*).—Attack by the spotted tree borer *S. guexi* is said to have followed injury to Lombardy poplars in the vicinity of Pleasanton, Calif., where in recent years the water table has receded. It is considered probable that until the trees suffered from drought they were not seriously injured by this insect.

Fumigation of baled cotton with hydrocyanic acid for the pink bollworm, A. C. Johnson, G. G. Becker, and L. A. Hawkins (*U. S. Dept. Agr., Tech. Bul. 623 (1938), pp. 46, figs. 9*).—A report is made of work undertaken to determine the most advantageous method of fumigating baled cotton with hydrocyanic acid under reduced pressures to kill any pink bollworms which might be present therein and to develop the mechanical equipment necessary for applying the process. Experimental work on fumigation of cotton under atmospheric pressures and mechanical equipment used in fumigation of cotton are described. Information applicable to the fumigation of other commodities was also obtained during the course of the study.

Two systems of fumigating at reduced pressures were compared in many of the studies—(1) low pressure, with the air pressure equivalent to approximately 2 in. of mercury, and (2) high pressure, in which it was raised from 20 to 25 in., as measured from absolute vacuum, after fumigant had been admitted. Under low-pressure fumigation the concentration of hydrocyanic acid in the center of the bale continued to increase for from 90 to 105 min., due to the diffusion of the fumigant into the bale. Diffusion was more rapid when the concentration outside the bale was high. The concentration of the fumigant in the air-hydrocyanic acid mixture could be increased either by increasing the quantity of the hydrocyanic acid or decreasing the quantity of air. Therefore, the lower the air pressure on the introduction of the fumigant, no further introduction of air being allowed, the higher was the concentration within the bale in a given time. The low-pressure system consistently gave much higher concentrations of the fumigation in the centers of the test bales.

The dosage of hydrocyanic acid per 100 cu. ft. of chamber space, including the load, found effective at low-pressure fumigation was 6 oz., with an exposure period of at least 2 hr. High-pressure fumigation was not consistently effective throughout the bale at any of the concentrations used.

More uniform concentration of the hydrocyanic acid within the bales in a commercial fumigation chamber could be obtained by separating the bales by 4- by 4-in. timbers between the different layers of bales. Experiments with bare larvae, larvae in seeds, and in the centers of bales show that a higher dosage of hydrocyanic acid was necessary to obtain complete mortality under high pressures than under low pressures, that is, the higher the concentration of hydrocyanic acid in the air-gas mixture the more effective the fumigation.

In a study of the effect of temperature on the dosage it was found that at temperatures above 51° F. at the center of the bale a complete mortality of the larvae in seeds inside the bale can be expected. The residual gas remaining in the bale after fumigation is completed plays an important part in the killing of the larvae in the interior of bales.

A method of fumigating at atmospheric pressures which insures a complete kill at a depth not greater than 3 in. within the bale was worked out.

Controlling the beet webworm, J. N. Roney. (Tex. Expt. Sta.). (*Tex. Farming and Citric., 15 (1938), No. 4, p. 19*).—It is pointed out that vegetable growers in the coastal area of Texas should be prepared to control the Hawaiian beet webworm. This pest has been the source of losses in Galveston County since 1933, early fall beets having been completely destroyed, and damage has occurred in the Lower Rio Grande Valley. Experiments at the Laboratory for Truck Crop Insect Investigations at Alta Loma have led to the recommendation that mixtures containing pyrethrum and sulfur be applied at the rate of 20 to 30 lb. per acre at intervals of a week or 10 days, commencing when the beets are 2 or 3 in. tall.

The feeding mechanism of adult Lepidoptera, J. B. Schmitt. (N. J. Expt. Stas.). (*Smithsn. Misc. Collect., 97 (1938), No. 4, pp. 28, figs. 12*).

Proceedings and papers of the Eighth Annual Conference of Mosquito Abatement Officials in California (*Calif. Mosquito Abatement Off., Ann. Conf., Proc. and Papers, 8 (1937), pp. [1]+45*).—Contributions presented at the meeting in Berkeley, Calif., on December 13, 1937, are: Review of Selected Literature Pertaining to Mosquitoes for Year 1937, by W. B. Herms (pp. 1–6); The Distribution of California Anophelines With Remarks on Collecting Methods, by T. H. G. Aitken (pp. 8–14); Power Oil Spray Equipment, by F. L. Hayes (pp. 22, 23); and Seeped and Flooded Areas Resulting From Irrigation, by J. B. Brown (pp. 27–30). A tabulation of information on the California mosquito abatement agencies is given in a supplement.

Report of the twelfth annual meeting, Florida Anti-Mosquito Association, L. W. Starck (*Fla. Anti-Mosquito Assoc. Rpt. Ann. Mtg., 12 (1938), pp. [98]*).—Among the many contributions presented at the meeting held at Jacksonville, Fla., in March 1938 are the following: Salt Marsh Surveys, by R. Broughman; Pyrethrum and Oils for Protection Against Salt-Marsh Sand Flies (Culicoides), by J. B. Hull and S. E. Shields, and A Consideration of Some Phases of the Mosquito Control Problem, by G. H. Bradley (both U. S. D. A.); Mosquito Control Auxiliaries, by H. D. Peters; The Program of the State Board of Health in Regard to Malaria Control Work, by G. F. Catlett; W. P. A. Malaria Control Accomplishments of the Past Year, by A. C. Newman; The Malaria Program in Georgia, by L. M. Clarkson; and Activities of the U. S. Public Health Service in Mosquito Control for Airplanes, by C. T. Carnahan.

On the relative attractiveness to Aëdes aegypti of certain coloured cloths, G. A. Brett (*Roy. Soc. Trop. Med. and Hyg., Trans., 32 (1938), No. 1, pp. 113–124, fig. 1*).—Description is given of a method of comparing the attractiveness of different colored cloths as alighting surfaces for mosquitoes when about to feed. Tests made with the yellow-fever mosquito revealed a preference for surfaces with a low reflection factor, especially black. Red was more attractive than several colors with a lower reflection factor. Blue was more repellent than several colors with a higher reflection factor. Light yellowish khaki was the most repellent color. Yellow was also strongly repellent. The mosquitoes were not prevented from alighting by a repellent color, but the number doing so was reduced. When no attractive color was present the reduction was small. Statistical analyses of the results showed that most of the differences were significant and demonstrated conclusively that this mosquito has color vision and a color preference.

Problems concerning the efficiency of oils as mosquito larvicides.—I, The stability of oil films on the surface of water, D. R. P. Murray (*Bul. Ent. Res., 29 (1938), No. 1, pp. 11–35, figs. 4*).—Experimental studies are reported, the details being given in 23 tables.

The reactions of mosquitoes to temperature and humidity, R. C. M. Thomson (*Bul. Ent. Res., 29 (1938), No. 2, pp. 125–140, figs. 6*).—Studies made of the reactions of *Culex fatigans* to temperature through the use of a new type of temperature gradient apparatus based on the same principle as the humidity alternative chamber are reported. The reactions to humidity were studied by means of the alternative chamber in a dark constant temperature room at 25° C.

On Culicoides as a vector of Onchocerca gibsoni (Cleland & Johnston 1910), J. J. C. Buckley (*Jour. Helminthol., 16 (1938), No. 3, pp. 121–158, pls. 5, figs. 15*).—An investigation of the vector of the nematode *O. gibsoni*, the cause of worm nodules in cattle, conducted in Kuala Lumpur, Federated Malay States, has shown several species of *Culicoides* of the dipterous family Ceratopogonidae to be intermediate hosts, namely, *C. pungens* de Meij., *C. oxystoma* Kieff, *C. shortti* Smith & Swam., and *C. orientalis* Macfie. A list is given of 28 references to the literature.

Morphology of the digestive tract of the blackfly Simulium nigroparvum, J. A. Cox. (Va. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 6, pp. 443–448, pls. 3*).—A study of both gross anatomy and histology of the digestive tract and mouth parts of the blackfly *S. nigroparvum* Twinn, which has been found by Johnson et al. to be responsible for transmission of a blood protozoan disease of turkeys as previously noted (E. S. R., 79, p. 687), is reported. The tract is said to be essentially similar to that of the related species of *S. vittatum* Zett., as reported by H. B. Hungerford,[4] and *S. ornatum* Meig., reported by Smart (E. S. R., 73, p. 358). A list is given of 12 references to the literature cited.

On the protection of sheep from maggot-fly, J. MacLeod (*Bul. Ent. Res., 29 (1938), No. 2, pp. 149–163, fig. 1*).—Experimental evidence relating to the protection of sheep from maggot fly, here given in detail, has led to the following conclusions: (1) Carbolic dips neither repel the adult fly nor prevent larvae from establishing active strike on the skin; (2) cresylic acid, incorporated in a mineral oil base, is not effective as a spray or as a dip in protecting susceptible sheep or preventing development of strike from blow; and (3) arsenic remains in the fleece and continues to exercise a protective effect against development of strike for some weeks after application. This protection may be only partial or almost complete; under winter conditions it lasts for about 4 weeks, and in the case of one form of soluble arsenic at least it has been shown to be only slightly affected by heavy rain.

The Mediterranean fruit-fly (Ceratitis capitata Wied.) in the Jordan Valley, A. Grünberg (*Bul. Ent. Res., 29 (1938), No. 1, pp. 63–76, figs. 3*).—Investigations of the Mediterranean fruitfly in Palestine, commenced in September 1935, are reported. Its damage in the upper Jordan Valley is said to be limited to the southern belt of citrus plantations, while further north, thus far, its activity remains restricted. The number of its hosts is relatively small in the valley, the citrus plantations supplying sufficient food during 7–8 mo. and figs, grapes, and other occasional plants serving as hosts during the period which follows a relatively long summer quiescent period (about 2 mo.).

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[4] Kans. Univ. Sci. Bul., 8 (1913), No. 10, pp. 365–382, pls. 3.

An annotated list of the Diptera (flies) of Alberta, E. H. Strickland (*Canad. Jour. Res., 16 (1938), No. 7, Sect. D, pp. 175–219, fig. 1*).—A complete list of species recorded as occurring within the Province of Alberta.

The flea problem on ranches, W. A. Riley. (Minn. Expt. Sta.). (*Amer. Fur Breeder, 9 (1936), No. 4, pp. 10, 12*).—A practical discussion of the life history and control of fleas infesting ranch foxes.

The tropical, or oriental, rat flea (Xenopsylla cheopis) established in Minnesota, W. A. Riley. (Univ. Minn.). (*Jour. Lancet, n. ser., 56 (1936), No. 11, pp. 591–592*).—The oriental rat flea, one of the most efficient carriers of bubonic plague and a vector of endemic, or murine, typhus in the United States and other countries, is said to have become established in Minnesota in spite of the long, cold winters. Infestation of the dairy barn of the College of Agriculture, which had become overrun by rats, is reported. It was also found on rats from 2 widely separated city dumps in St. Paul, 330 having been taken from 1 lot of 30 rats.

Occurrence of the oriental rat flea in the interior of the United States, H. E. Ewing and I. Fox. (U. S. D. A. and Iowa State Col.). (*Science, 88 (1938), No. 2288, p. 427*).—This contribution, reporting the occurrence of the oriental rat flea in the interior of the United States, including Iowa, Illinois, Ohio, and Minnesota, supplements the account by Riley above noted.

The Japanese beetle, C. C. Hamilton. (N. J. Expt. Stas.). (*Shade Tree, 11 (1938), No. 5, [pp. 2, 3]; also in Florists Exch. and Hort. Trade World, 90 (1938), No. 25, pp. 11, 13*).—A practical contribution.

Reduce sugarcane beetle injury by planting varieties giving better stands, J. W. Ingram, W. E. Haley, and L. J. Charpentier. (U. S. D. A.). (*Sugar Bul., 17 (1938), No. 1, pp. 37, 38*).—In counts made at the height of sugarcane beetle infestation in April 1938 in variety-test fields in Louisiana, Co. 290, C. P. 29/116, and C. P. 28/11 varieties of cane were found to give the best stands. Similar results were obtained in earlier years when these varieties were present in variety-test fields. This has led to the recommendation that these three varieties be planted in the areas usually suffering heavy beetle injury on all types of soil.

A note on the size and composition of old Tribolium confusum populations, T. Park (*Amer. Nat., 72 (1938), No. 738, pp. 24–33, fig. 1*).—The results of an analysis of the composition of 200 cultures of the confused flour beetle raised in four initially distinct types of flour and allowed to grow unmolested are reported upon.

Three new injurious Curculionidae (Col.), G. A. K. Marshall (*Bul. Ent. Res., 29 (1938), No. 2, pp. 211–213*).—*Protostrophus dianthi*, reported damaging leaves of carnation in Cape Province, *Pantomorus inimicus*, a serious pest of apple trees in Rio Grande do Sul, Brazil, and *Paraplesius ugandanus*, found damaging tea leaves in Uganda, are described as new species.

A new genus and species of orchid weevils (Coleoptera, Curculionidae, Barinae), L. L. Buchanan (*Hawaii. Ent. Soc. Proc., 9 (1935), No. 1, pp. 45–48*).—Under the name *Orchidophilus peregrinator* n. g. and sp. a description is given of a weevil which attacks orchids in Hawaii.

Evidence Indians of ancient times knew modern orchard pest, P. J. Chapman (*Farm Res. [New York State Sta.], 4 (1938), No. 4, p. 11, figs. 2*).—The evidence presented indicates that the worm found by the Indians in wild American plums, which they picked and dried even before the arrival of the white man, was no other than the larva of the plum curculio.

Pollen substitutes and how to use them, M. H. Haydak. (Minn. Expt. Sta.). (*Amer. Bee Jour., 77 (1937), No. 6, p. 271*).—In the author's experiments young bees that had never eaten pollen were kept in confinement, in colonies of from 5,000 to 7,000, with various food materials. Only colonies that were given dried yeast, fresh whole milk, skim milk powder, egg white, egg yolk, whole egg, meat scrap, cottonseed meal, soybean flour, and the mixtures of cottonseed meal or soybean meal with skim milk powder reared brood.

Selection and breeding bees for temperament, C. H. Gilbert. (Wyo. Expt. Sta.). (*Amer. Bee Jour., 78 (1938), No. 1, pp. 20, 21*).—A brief statement of work conducted by the station.

A method of sun-bleaching beeswax, G. H. Vansell and C. S. Bisson. (U. S. D. A. and Calif. Expt. Sta.). (*Amer. Bee Jour., 77 (1937), No. 11, p. 537*).—A modification of the sun method by causing the beeswax to remain liquid throughout the bleaching tests is said to have given encouraging results. Such bleached wax did not become snow white, but all traces of the characteristic yellow contaminating color disappeared from the majority of the samples. The details of wax exposures to sunlight at Wabuska, Nev., are presented in table form.

History of American beekeeping, F. C. Pellett (*Ames, Iowa: Collegiate Press, Inc., 1938, pp. IX+213, figs. 98*).—This work, presented in 25 chapters, covers the subject of American beekeeping down to the World War.

Honey production in the British Isles, R. O. B. Manley (*Reading, Eng.: Bradley & Son. 1936, pp. 343, pls. 15, [fig. 1]*).—A practical work by a commercial apiarist presented in 22 chapters. Mammal and insect enemies and diseases of the brood and of the mature insect are included in the account.

Bee-keeping, new and old, described with pen and camera, II, W. Herrod-Hempsall (*London: Brit. Bee Jour., 1937, vol. 2, pp. VII+773-1842, [pl. 1], figs. [724]*).—This second volume adds 20 chapters (making a total of 35), together with a glossary and epilogue, to the work previously noted (E. S. R., 65, p. 362).

A revision of the genus Megachile in the Nearctic region, VII, VIII, T. B. Mitchell. (N. C. Expt. Sta.). (*Amer. Ent. Soc. Trans., 63 (1937), Nos. 2, pp. 175-206, pls. 2; 4, pp. 381-426, pls. 4*).—Contributing further (E. S. R., 77, p. 670), part 7 deals with the taxonomy of the subgenus *Sayapis* (Hymenoptera: Megachilidae) and part 8 with the taxonomy of the subgenus *Chelostomoides* (including addenda and an index).

The life-history and habits of the digger-wasp Ammobia pennsylvanica (Linn.), J. A. Frisch (*Amer. Midland Nat., 19 (1938), No. 3, pp. 673-677*).—An account of the digger wasp *A. pennsylvanica*, the life history of which closely resembles that of *A. ichneumonea* (E. S. R., 79, p. 228). Only those features in which it differs from this close relative are presented. Parasites collected from the cells of the wasp are *Senotainea trilineata* (V. d. W.), both as larvae and as pupae; *Apiochaeta* sp., as pupae; *Parilampus* n. sp. and *P. hyalinus* (Say), both as secondary parasites on *S. trilineata;* and *Brachymeria* n. sp., as secondary parasite on an unidentified sarcophagid.

Influence of Japanese beetle instar on the sex population of the parasite Tiphia popilliavora, M. H. Brunson. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 5, pp. 379-386*).—In further work reported (E. S. R., 71, p. 356) it was found that when second-instar and third-instar larvae of the Japanese beetle were placed with the female of the hymenopterous parasite *T. popilliavora* Roh. alone, together, or on alternate days, the wasp progeny from second-instar beetle larvae were predominantly males and those from third-instar larvae predominantly females. The progeny from eggs transferred from second-instar larvae to third-instar larvae and vice versa did not differ in sex ratio from those emerging from eggs that were allowed to remain on the original host, indicating that the sex of the progeny is determined at the time the egg is placed on the host larva. That the presence of third-instar host larvae is necessary for the parasite to survive and increase in numbers explains its variation in population at different colony points annually and at all colony points at intervals of several years in New Jersey and Pennsylvania, as surveys during August, when adult parasites are most abundant in the field, have shown that third-instar larvae may be relatively abundant or scarce at that time.

Several undescribed mymarid egg-parasites of the genus Anagrus Haliday, H. L. Dozier (*Hawaii. Ent. Soc. Proc., 9 (1936), No. 2, pp. 175–178*).—Under the name *A. insularis* a parasite which was reared from eggs in the leaves of *Ipomoea bona-nox* in Haleauau, Oahu, and also from eggs of a native damsel fly (*Agrion* sp.) in the leaves of *Commelina nudiflora* in Hering Valley, Tantalus, Oahu, is described as new. A second species of the genus host unknown but thought to be an egg parasite is described as new under the name *A. delicatus*.

A new genus and species of Encyrtidae parasitic in the pineapple mealybug (Pseudococcus brevipes (Ckll.)), H. Compere. (Calif. Citrus Expt. Sta.). (*Hawaii. Ent. Soc. Proc., 9 (1936), No. 2, pp. 171–174, fig. 1*).—*Hambletonia pseudococcina* n. g. and sp., reared from the pineapple mealybug at São Paulo, Brazil, is described. This is said to be the third species of Encyrtidae known to attack the pineapple mealybug in Brazil.

The species of Aenasius, encyrtid parasites of mealybugs, H. Compere. (Calif. Citrus Expt. Sta.). (*Hawaii. Ent. Soc. Proc., 9 (1937), No. 3, pp. 383–404, figs. 4*).—A key for the separation of the species of *Aenasius* females and descriptions of 11 new species are presented, together with a key to the genera of short, stout-bodied encyrtids with thimblelike punctation on the head that are known to be parasitic in mealybugs.

Seasonal distribution of tick parasites, C. L. Larson and R. G. Green. (U. S. D. A. and Univ. Minn.). (*Jour. Parasitol., 24 (1938), No. 4, pp. 363–368*).—Of the 3,115 engorged nymphs and 4,451 engorged larvae of the rabbit tick collected in Morrison County, Minn., between April 2 and November 22, 1935, 3.3 percent of the nymphs and 7.4 percent of the larvae were found to be parasitized by *Ixodiphagus texanus*. The study indicates that this parasite is capable of producing but one generation a year. In a group of affected ticks in which the parasites were counted an average of 5.4 emerged from the nymphs and 2.1 from the larvae. The effect of *I. texanus* as a biological factor in the area studied does not appear to be of great significance.

The male genitalia in the Hymenoptera (Insecta), especially the family Ichneumonidae, I, II, O. Peck (*Canad. Jour. Res., 15 (1937), Sect. D, Nos. 11, pp. 221–252, figs. 158; 12, pp. 253–274*).—In work on (1) the comparative morphology (pp. 221–252) and (2) the taxonomy of the genitalia (pp. 253–274) of parasitic Hymenoptera of the family Ichneumonidae, 34 tribes and 96 species were investigated. A list of 142 references to the literature is included.

Agropyron smithii Rydb. and Cephus cinctus Nort., H. L. Seamans and C. W. Farstad (*Ecology, 19 (1938), No. 2, p. 350*).—It having been recommended that *A. smithii* be extensively used in the soil conservation program, the authors call attention to the fact that investigations of the wheat-stem sawfly in Canada have shown this grass to be an exceptionally favorable host. Many instances have been recorded where severe losses to wheat crops have been traced to wheat-stem sawfly migrations from small patches of *A. smithii* that were serving as permanent reservoirs. Thus, to advocate the widespread planting of *A. smithii* for seed production, particularly in a large portion of the Canadian prairies and some parts of western United States, is to invite a wholesale outbreak of the wheat-stem sawfly.

Stenobracon nicevillei Bingh. (Hym.: Brac.), a natural enemy of the sugar-cane white moth borer (Scirpophaga), M. C. Cherian and P. Israel (*Bul. Ent. Res., 29 (1938), No. 1, pp. 99–102, figs. 9*).—This contribution gives information on the habits and life history of the braconid *S. nicevillei* and its efficacy in controlling the sugarcane white moth borer *Scirpophaga auriflua* Zell.

The black wheat-stem sawfly, J. S. Houser (*Ohio Sta. Bimo. Bul. 194 (1938), pp. 174, 175, fig. 1*).—The findings obtained (E. S. R., 78, p. 375) as the result of a visitation to 26 counties slightly in advance of wheat harvest are said to have shown the black wheat-stem sawfly to have decreased sharply during the season with little advance having been made in the spread westward. There is said to be some evidence that parasitic insects may have been of considerable importance in the reduction. A map indicating the average percentage of the wheat infested by the sawfly in 1938 in the counties visited is included.

On the ecology of the citrus red spiders in Palestine, H. Z. Klein (*Bul. Ent. Res., 29 (1938), No. 1, pp. 37–40, fig. 1*).—Two species of red spiders found in Palestine, namely, *Anychus orientalis* Zacher and the common red spider Hanst., are differentiated on the basis of ecological data, breeding experiments, and activity trials. The common red species is found to be a cosmopolitan, while the oriental red spider is a subtropical element.

Eriophyid studies, H. H. Keifer (*Calif. Dept. Agr. Bul., 27 (1938), No. 2, pp. 181–206, figs. 20*).—Studies made in the citrus districts of southern California in which the citrus bud mite *Eriophyes sheldoni* Ewing is of importance have led to the recognition of 16 additional forms. Two genera (*Platyphytoptus* and *Phyllocoptruta*) are erected and 9 species are described as new.

Control measures for rust mites, J. R. Watson (*Citrus Indus., 19 (1938), No. 7, pp. 15, 18*).—A practical contribution.

Spider mite control in the Rogue River Valley, L. G. Gentner. (Oreg. Expt. Sta.). (*Better Fruit, 32 (1938), No. 10, pp. 3, 4,*).—A practical contribution on the control of *Tetranychus bimaculatus* Harvey, one of the major pests of pear trees in the Rogue River Valley of Oregon. This mite has been causing serious injury to pear since about 1924 and apple trees have been injured occasionally. Recent investigations show that other closely related species, such as the Willamette mite *T. willamettei* McG. and the Pacific mite *T. pacificus* McG., are also involved.

Vertical migration, distribution, and survival of infective horse strongyle larvae developing in feces buried in different soils, J. T. Lucker. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *57 (1938), No. 5, pp. 335–348, fig. 1*).—In the experiments conducted (E. S. R., 75, p. 545) known numbers of strongyle eggs in horse feces were buried 3.5, 6.5, 8.5, and 10.5 in. in four types of frequently moistened soil kept indoors in containers of special design. The surface layer of the soil was removed at frequent intervals from each container and examined for infective larvae by means of the Baermann apparatus.

During the first 5.5 mo. of these examinations no larvae were recovered from the surface of clay and only a few from the surface of sandy clay loam, while from the surface of fine sandy loam and of coarse sand larvae equivalent to from 0.1 to 8.9 and 0.04 to 2.6 percent, respectively, of the eggs buried were recovered. These percentages were inversely related to the depths of burial in these soils. Further examination of the entire content of eight of the containers (two of each type of soil with depths of burial 3.5 and 8.5 in.) 3.5 and 6 mo. after burial of the feces showed that in clay and sandy loam there was a marked concentration of larvae in the feces and in the soil directly above the feces. In fine sandy loam and in coarse sand there was a more uniform vertical distribution of larvae. There was no evidence of extensive lateral migration. The larvae recovered from the fecal and soil content of the eight containers and those previously recovered from the surface of the soil in these containers accounted for from 1.3 to 29.9 percent of the eggs buried. This proportion was highest in sandy clay loam, intermediate in clay and fine sandy loam, and lowest in coarse sand. In a given soil, it was greater following burial to the shallowest depth (3.5 in.).

Studies on the life history and biology of the fowl tapeworm Raillietina cesticillus (Molin), W. M. Reid, J. E. Ackert, and A. A. Case. (Kans. Expt. Sta.). (*Amer. Micros. Soc. Trans., 57 (1938), No. 1, pp. 65–76, fig. 1*).—A report is made of the life history of the chicken cestode *R. cesticillus*, which has been restudied and physiological experiments involving 300 chickens and 570 beetles conducted.

"Two genera and 12 species of ground beetles (Carabidae) which previously have not been reported can act as intermediate hosts for the fowl tapeworm *R. cesticillus*. These beetles are *Pterostichus torvus* Lec., *P. permundus* Say, *P.* (*Anaferonia*) near *constrictus* Say, *Amara obesa* Say, *A. latocolis* Lec., *A. muscula* Say, *A. fallax* Lec., *A. basilaris* Say, *Anisotarsus subvirens* Scy., *Chlaenius tomentosus* Say, *Anisodactylus rusticus* Say, and *Harpalus pennsylvanicus* De G. Nearly all species of *Amara* which have been tested have proved to be intermediate hosts of *R. cesticillus*, but in the genera *Pterostichus* and *Harpalus* some species can be while others cannot.

"As many as 626 cysticercoids were produced by 1 beetle which had been fed 4 proglottids. The size of the cysticercoids is partly dependent upon the number of cysticercoids in a beetle and upon the species of beetle. Cysticercoids usually develop into adult tapeworms in about 2 weeks, although tapeworms with gravid proglottids were produced in 11 days after the fowl had swallowed cysticercoids. Technics were developed which facilitated the infection of beetles with onchospheres, the rearing of infected beetles, and the feeding of the fully developed cysticercoids to chickens, thus making possible critical studies of host-parasite relationships."

Observations on the life history of Fasciola gigantica, the common liver fluke of cattle in Hawaii, and the intermediate host, Fossaria ollula, J. E. Alicata (*Hawaii Sta. Bul. 80 (1938), pp. 22, figs. 6*).—Report is made of an investigation of the development and biology of the fluke *F. gigantica* and its intermediate hosts with a view to practical control of the parasite in the field. Examinations made of large numbers of flukes collected from cattle on various islands in the Territory have shown this species to be the common form infesting cattle in Hawaii (E. S. R., 77, p. 521). Of the several common freshwater snails found in fluke-endemic areas, *F. ollula* is the only one found naturally infested with cercariae of *F. gigantica*. When exposed to experimental infestation with miracidia, only *F. ollula* acquired the infestation. These findings indicated that the control of the molluscan carrier in Hawaii should be directed against *F. ollula*.

At a temperature of from 78° to 82° F. eggs of *F. gigantica* required 14 days to develop and hatch as miracidia. The various stages in the development of *F. gigantica* in the snail have been followed in detail, and motile cercariae have been found to escape from snails 39 days following experimental infestation. Metacercariae encysted on honohono plants which were replanted and exposed in a sunny area were found viable after 15 days but not after 42 days; this indicates that sunlight or possibly a state of dryness exerts a lethal effect on the encysted metacercariae. Laboratory animals became infested as a result of being fed encysted metacercariae which had been in running water for 122 days. Metacercariae were not found infestuous after 3 months' exposure in silage.

"The development of the fluke has been observed in the guinea pig, rabbit, calf, and pig. In rabbits the fluke reached the egg-laying period in from 77 to 84 days, and in a calf 84 days following experimental infestation.

"The snail *F. ollula* has been noted most commonly in the lowlands and windward side of each island, where fluke infestation in cattle is most common, and in various localities such as marshes, flowing streams, and water troughs.

"Snails have been found to oviposit when they are about 26 to 42 days old; they have reached a length of about 13 mm. The life span of five snails kept under laboratory conditions was found to vary from 114 to 164 days."

A list of 16 references to the literature is included.

Formation of the egg shell in Fasciola hepatica as demonstrated by histological methods, P. Kouri and R. W. Nauss. (Cornell Univ. et al.). (*Jour. Parasitol., 23 (1938), No. 4, pp. 291–310, figs. 21*).—A report of a study, the details of which are illustrated through the reproduction of 14 photomicrographs.

A check- and host-list of Ixodoidea (ticks) occurring in India, P. Sen (*Indian Jour. Vet. Sci. and Anim. Husb., 8 (1938), No. 2, pp. 133–147*).—An annotated host list is followed by a host-parasite list.

ANIMAL PRODUCTION

[Animal nutrition studies in Tennessee], E. K. Weathers (*Tennessee Sta. Rpt. 1937, pp. 6, 26, 27*).—The chemical composition of Korean lespedeza hay from untreated and from limed and phosphated areas and the suitability for animal feeding of synthetic phosphates are indicated.

The composition of different kinds of silage, A. M. Smith and A. Comrie (*Jour. Agr. Sci. [England], 28 (1938), No. 2, pp. 203–211*).—Data are presented on the chemical composition of eight samples of fresh grass and legume mixtures and 91 samples of silages, including A. I. V. grass and legume silage, molasses grass silage, and grass silage without preservatives stored in pits and trenches, stacks, and tower silos. The pH of most of the A. I. V. samples ranged from 3.5 to 3.8, and these contained less volatile acids and volatile bases and showed a higher proportion of lactic to acetic acid and amino acids to volatile bases than the other silages, which in general showed rather close agreement between pH, volatile acids, and volatile bases.

Some relationships of soil to plant and animal nutrition—the major elements, C. A. Browne (*U. S. Dept. Agr. Yearbook 1938, pp. 777–806, figs. 4*).—This review article summarizes the effects of soil type, cropping system, crop variety, date of harvest, climate, water supply, and soil fertilization upon the mineral content of plants, with particular reference to potassium, calcium, magnesium, and phosphorus. The relationship of soil deficiencies of major elements to plant nutrition and in turn to animal nutrition are discussed.

A comparison of the vitamin D potency of the stemmy and leafy portions of alfalfa hay, G. C. Wallis. (S. Dak. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 5, pp. 393–396*).—In a sample of good quality green-colored alfalfa hay the leaves and stems represented 49.4 and 50.6 percent, respectively. The vitamin D content of the leaves was about 10.45 International Units per gram and of the stems 1.72 I. U. per gram, as determined by the standard line-test technic.

Vitamin E, B. W. Fairbanks. (Univ. Ill.). (*North Amer. Vet., 19 (1938), No. 2, pp. 31–34, 35*).—The literature is briefly reviewed.

Variations in the reproductive behavior of different species of mammals restricted to vitamin E-deficient rations, B. H. Thomas, C. Y. Cannon, S. H. McNutt, and G. Underbjerg. (Iowa State Col.). (*Jour. Nutr., 15* (*1938*), *No. 6, Sup., pp. 10, 11*).—This is a preliminary report on male and female goats able to reproduce for several generations on a specially prepared vitamin E-deficient ration which regularly produced resorption gestations when fed to female rats. Preliminary trials with rabbits and sheep agree in part with those obtained with goats.

Crystalline factor I, S. Lepkovsky. (Univ. Calif.). (*Science, 87* (*1938*), *No. 2251, pp. 169, 170*).—Following a report on the multiple nature of the third factor of the vitamin B complex (E. S. R., 76, p. 839), the isolation of factor 1 in crystalline form is announced. This material proved highly potent in stimulating growth in rats which had ceased to grow on a factor 1-deficient diet.

The requirement for vitamin K of some different species of animals, H. Dam, F. Schønheyder, and L. Lewis (*Biochem. Jour., 31* (*1937*), *No. 1, pp. 22–27*).—Evidence was obtained to indicate a marked difference in the vitamin K requirement of different species of animals. The hemorrhagic disease was consistently produced in chicks, ducklings, and young geese reared on a K-deficient diet, and the clotting power of the blood was restored to normal when vitamin K concentrate was administered to depleted chicks and ducklings. The disease developed very slowly in pigeons and canaries, and rats, guinea pigs, and dogs were carried for extended periods on the basal diet without showing any symptoms of the disease. Experiments with rabbits and pigs were inconclusive, but typical symptoms of the hemorrhagic disease were not developed.

The effect of arsenic on the toxicity of seleniferous grains, A. L. Moxon. (S. Dak. Expt. Sta.). (*Science, 88* (*1938*), *No. 2273, p. 81*).—Studies on the toxicity of selenium in combination with either tellurium, arsenic, vanadium, nickel, tungsten, or molybdenum in the diet of rats gave evidence that 5 p. p. m. of arsenic added to the drinking water gave complete protection and 2.5 p. p. m. gave partial protection against liver injury and other characteristic symptoms of selenium poisoning in rats receiving 15 p. p. m. of selenium in the diet in the form of seleniferous wheat. Evidence was also obtained that arsenic was equally effective in preventing the general toxic effects of inorganic selenium, but feeding arsenic to livestock as a protection against selenium poisoning is not recommended on the basis of these preliminary findings.

Effect of supplementing winter and summer range on gains of steers in the northern Great Plains, W. H. Black and V. I. Clark (*U. S. Dept. Agr., Tech. Bul. 628* (*1938*), *pp. 16, figs. 9*).—Summarizing the results of 3 years' experimentation at the Ardmore (S. Dak.) Field Station, it is shown that the winter feed cost for steers wintered on the range was about 40 percent less than that of steers wintered in dry lot. The average cost of winter (142 days) feed per steer was $10.49, $6.62, $6.89, and $5.12, and the average total winter gains per steer were 24, 28, 18, and 8 lb. for steers wintered in dry lot and on range, with 0.78 lb. of cottonseed cake daily, with 1.5 lb. of corn daily, and with no grain supplement, respectively. In seasons of normal rainfall steers wintered on native range reserved for winter use required supplementary feeding only during the days of extremely low temperature or when the vegetation was snow covered. When the steers used in the wintering tests were grazed on range as 2-year-olds during the succeeding summer, the feeding of approximately 10 lb. of grain supplement per steer daily very materially increased the rate of gain over that made by steers on range only. At prevailing prices, the increased cost of grain due to supplemental feeding was more than offset by the increased sale value of the steers. These steers carried sufficient finish to be marketed as slaughter steers rather than as feeders.

Differentiation of cattle and carabao meat by chemical treatment of fat, A. B. Coronel and T. Tapacio (*Philippine Jour. Anim. Indus., 5 (1938), No. 1, pp. 5–20*).—Continuing this line of investigation (E. S. R., 78, p. 837), a comparison of the intensity of yellow color in ether extracts of fat samples from cattle and carabao meats permitted a differentiation of these meats with 97 percent accuracy. By simply exposing either fresh or salted fat samples from these meats to direct sunlight it was found that fat from cattle was rapidly bleached in color while carabao samples underwent little change in color, permitting differentiation with about 95 percent accuracy.

Application of spectrophotometry to the study of certain changes occurring in hemoglobin pigments during the curing of meats, W. M. Urbain (In *Spectroscopy in Science and Industry: Proceedings of the Fifth Summer Conference on Spectroscopy and Its Applications, 1937. New York: John Wiley & Sons; London: Chapman & Hall, 1938, p. 101*).—The use of the polarizing spectrophotometer in determining the action of air and of the chief curing agents upon the hemoglobin pigments during the curing of meat is briefly described.

Effect of calcium supplements on gains of lambs fed sorghum fodder or sorghum silage as the roughage portion of the fattening ration, J. M. Jones and W. L. Stangel (*Texas Sta. Bul. 563 (1938), pp. 47*).—The results of six feeding trials are summarized in which the value of alfalfa hay in lamb fattening rations was compared with that of sorghum fodder, sorghum silage, or combinations of the two, when the sorghum roughages were fed with and without calcium supplement. The calcium was supplied in the form of pulverized limestone or pulverized oystershell at rates ranging from 0.2 to 0.47 oz. per lamb daily. The lots receiving alfalfa hay in all six experiments made decidedly larger gains than those fed the sorghum roughage without supplement, but the addition of calcium to the sorghum roughage resulted in larger gains similar to those produced by the alfalfa. Carcasses of lambs on the supplemented sorghum ration also graded as high as those in the alfalfa group. The actual productive energy of the supplemented sorghum roughages much more closely approached their calculated productive values than in the case of the unsupplemented sorghum feeds. Moreover the inclusion of calcium increased the daily consumption of fodder per lamb by approximately 0.1 lb. and of silage by about 0.5 lb. Standardizing the rate of calcium feeding at about 0.4 oz. of supplement per head daily during the last three trials showed this to be a safe and satisfactory level.

Lamb and mutton on the farm, K. F. Warner (*U. S. Dept. Agr., Farmers' Bul. 1807 (1938), pp. II+25, figs. 26*).—This is a revision of and supersedes Farmers' Bulletin 1172 (E. S. R., 44, p. 471).

Studies in mineral metabolism.—XXXVIII, Calcium and phosphorus in the nutrition of growing pigs, A. Theiler, P. J. du Toit, and A. I. Malan (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 9 (1937), No. 1, pp. 127–164, figs. 11*).—Continuing this line of investigation (E. S. R., 78, p. 835), data are presented on the effect upon growing pigs of rations deficient in phosphorus, calcium, or both, as measured in terms of body weight, feed consumption, calcium and phosphorus content of the blood, and the physical, chemical, and histological changes occurring in the bones. In the presence of abundant amounts of vitamin D and calcium, 0.1 percent phosphorus in the ration or a total phosphorus intake of 0.8 g per pig daily resulted in markedly retarded growth, severe rickets, low inorganic phosphorus of the blood, and a high serum phosphatase level. When the calcium intake was restricted to 0.1 percent of the ration or 1 g daily in the presence of abundant phosphorus and vitamin D, growth of the pigs was retarded but neither serum phosphatase nor serum calcium was significantly affected. Bone ash was reduced and bone atrophy was observed, but no symptoms of rickets occurred. A deficiency of both calcium and phosphorus (1 g of calcium and 0.6 g of phosphorus daily) resulted in slightly retarded growth after 20 weeks' feeding and decreased food consumption, but blood phosphorus was not so low as that of pigs on phosphorus deficiency with calcium excess. Bone atrophy and some indication of rickets occurred under this regime. When ample amounts of both calcium and phosphorus were fed there was little difference in growth rates, blood picture, or bone structure when calcium and phosphorus ratios of 2:1, 1:0.22, and 1:1.4 were used.

Poultry husbandry, M. A. Jull (*New York and London: McGraw-Hill Book Co., 1938, 2. ed., pp. VIII+548, figs. 213*).—The second edition of this popular textbook deals with the background of the poultry industry, the fundamental principles involved in various poultry practices, and up-to-date information concerning methods of poultry production and marketing. Selected lists of references to the literature follow each chapter.

On the influence of protein on the fattening of fowls, E. T. Halnan (*Jour. Agr. Sci.* [*England*], *28* (*1938*), *No. 2, pp. 341–345*).—Studies at the Animal Nutrition Institute, Cambridge, indicated that the principal changes in the composition of adult fowls during fattening was an increase in fat content of the body with relatively small increases in body protein. Rations composed of dried skim milk and Sussex ground oats in proportions of 5:95 (12.47 percent protein) and 20:80 (16.14 percent protein) were utilized with equal efficiency by fattening fowls.

The manganese content of feedstuffs and its relation to poultry nutrition, P. J. Schaible, S. L. Bandemer, and J. A. Davidson (*Michigan Sta. Tech. Bul. 159* (*1938*), *pp. 32*).—Perosis was consistently produced in a high percentage of experimental chicks by feeding either a high mineral content ration in which bonemeal was added to an otherwise satisfactory ration or a ration containing a high percentage of corn and consequently low in manganese content. Increasing the manganese content of either type of ration prevented the occurrence of perosis in most instances. The minimum manganese requirement of chicks was determined to be about 40 p. p. m. in the ration, but excess mineral in the diet necessitated a higher level. More than 40 p. p. m. of manganese in the laying ration was of no further advantage with respect to production, fertility and hatchability of eggs, embryo mortality, or number of weak and crippled chicks. The manganese content of a large number of ores and manganese-bearing compounds is reported, and with the exception of rhodonite and rhodochrosite these proved satisfactory sources of manganese in the chick ration. The manganese content of a wide variety of feeding stuffs is also reported. The manganese content varied with the plant species as well as with the fertility and acidity of the soil on which the plants were grown and the stage of maturity when harvested.

Experiments with a factor promoting growth and preventing paralysis in chicks on a simplified diet, T. H. Jukes and S. H. Babcock, Jr. (Univ. Calif.). (*Jour. Biol. Chem., 125* (*1938*), *No. 1, pp. 169–181, fig. 1*).—Employing a basal diet previously described (E. S. R., 78, p. 236) which produced nutritional paralysis in chicks, the addition of 10 percent of natural alfalfa meal or hexane-extracted alfalfa meal to the diet promoted growth and protected against paralytic symptoms, while the hexane extract fed at a level equivalent to 40 percent of alfalfa meal had only a very slight effect. Warm water extraction of the hexane-extracted alfalfa meal removed most of the active factor.

Nicotinic acid amide was ineffective against this disorder, and 15 percent peanut meal in the diet was only partially effective. Feeding a natural diet treated with ferric chloride did not produce these symptoms. It appeared that there are two different forms of the same active factor or factors, since a fat-soluble fraction prepared from soybean oil and a water-soluble fraction prepared from fat-extracted alfalfa meal were equally effective in protecting against paralysis.

The antiparalytic vitamin of the chick, T. H. Jukes and S. H. Babcock, Jr. (Univ. Calif.). (*Jour. Biol. Chem., 123 (1398), No. 3, pp. LXV, LXVI*).—An abstract of the above report.

The metabolism of pyruvic acid in vitamin B_1 deficiency and in inanition, M. A. Lipschitz, V. R. Potter, and C. A. Elvehjem. (Wis. Expt. Sta.). (*Jour.* (*Biol. Chem., 123 (1938), No. 1, pp. 267–281, fig. 1*).—Continuing this line of investigation (E. S. R., 76, p. 840), the oxygen uptake and removal of pyruvate by liver, kidney, and brain tissue from normal, fasted, and polyneuritic chicks were determined. Various concentrations of pyruvate substrate were employed. These tissues from polyneuritic chicks showed an impaired ability to utilize the pyruvate substrate as compared with tissues from normal birds, brain tissue showing the greatest derangement in this respect. Liver and kidney tissue from fasted birds declined in pyruvate-removing ability, approaching the level of such tissues from polyneuritic birds, but brain tissue from fasted birds was not so affected. Feeding glucose to fasted chicks restored the normal pyruvate-removing capacity of the liver, while such feeding of polyneuritis chicks resulted in deposition of liver glycogen and an increased though subnormal ability to remove pyruvate. These findings suggest that in polyneuritis inanition is not the sole reason for deranged pyruvate metabolism.

The rachitogenic properties of cereals in chick rations, H. D. Branion, J. E. Stackhouse, and H. Hull (*Sci. Agr., 18 (1938), No. 8, pp. 447–461, figs. 9*).—In an experiment to determine the effects of cereal grains on avian bone development with graded doses of vitamin D (irradiated ergosterol), groups of chicks were reared on rations in which corn, wheat, oat groats, oats, and barley, respectively, were used as principal sources of grain. A total of 43 lots of 50 birds each were included. At least 20 mg (1 drop) of 250D viosterol per chick daily were required to promote optimum growth and livability and normal bone calcification. At this level of feeding the ash in the leg bones of the various groups of chicks varied from 46.5 to 50.4 percent. Rations containing oat groats in combination with other grains permitted slightly higher bone ash than corresponding rations containing ground oats instead of the ground oat groats. There was no definite evidence that oats or oat groats contained any anticalcifying factor in excess of corn, wheat, or barley. There was a higher incidence of perosis in the groups receiving high levels of corn than in the other groups.

Effectiveness of chondroitin as the anti-gizzard erosion factor required by chicks, H. R. Bird and J. J. Oleson. (Univ. Wis.). (*Jour. Biol. Chem., 123 (1938), No. 3, pp. XI, XII*).—Feeding chondroitin at 3- to 5-percent levels exerted a marked protective action against the development of gizzard erosions in chicks. Active chondroitin preparations were obtained by alkaline extraction and by 10-percent calcium chloride extraction of cartilage tissue.

The coagulation defect in sweet clover disease and in the hemorrhagic chick disease of dietary origin; A consideration of the source of prothrombin, A. J. Quick (*Amer. Jour. Physiol., 118 (1937), No. 2, pp. 260–271, figs. 2*).—Feeding spoiled sweetclover hay to rabbits markedly reduced the prothrombin level in the blood plasma and was accompanied by a distinct hemorrhagic tendency. Including 5 percent alfalfa or a small quantity of dehydrated alfalfa meal with the toxic hay successfully prevented the development of this disease by maintaining plasma prothrombin at a safe level. The addition of a small amount of dehydrated alfalfa meal in the ration of chicks previously depleted of vitamin K likewise effectively restored the plasma prothrombin, suggesting that alfalfa exerts a curative effect by supplying an accessory food factor required by the organism for the synthesis of prothrombin.

Failure of alfalfa to prevent the hemorrhagic sweetclover disease, W. K. SMITH. (U. S. D. A. and Univ. Wis.). (*Science, 87 (1938), No. 2262, p. 419*).—The author reports that in a series of tests with rabbits in which various amounts and qualities of alfalfa hay were fed as supplements to toxic sweetclover no evidence was obtained to indicate that alfalfa exerts a protective action against hemorrhagic sweetclover disease. A marked variation in the susceptibility of different strains of rabbits to this disease was noted.

Further studies on the curvature of the breastbone in chickens, with particular reference to its inheritance [trans. title], P. CARSTENS and J. PRÜFER (*Arch. Geflügelk., 12 (1938), No. 3, pp. 78–94, figs. 6, Eng. abs., pp. 93, 94; abs. in Harper Adams Util. Poultry Jour., 23 (1937–38), No. 7, p. 213*).—Continuing this study (E. S. R., 76, p. 382), the investigation has been extended to White and Brown Leghorn hens from 6 mo. to 4 yr. of age. It appeared that curvatures may develop in hens 3 or 4 yr. of age which had previously been normal. It could not be demonstrated, however, that even severe cases of curvature exerted a detrimental effect on constitutional characters. A study of the daughters of a cock with a straight breastbone and another with a very crooked breastbone showed that without reference to type of dam the percentages of daughters having straight, slightly crooked, and very crooked breastbones were 60.4, 38.9, and 0.7, respectively, for the first sire and 48.5, 30.9, and 20.6, respectively, for the second sire. Segregation of the daughters on the basis of presence or absence of this character in the dams showed a correlation between the occurrence of this character in the dam and her progeny. These differences were statistically significant, proving that this tendency may be inherited.

A review of the literature on embryonic malpositions and their effect on hatchability, M. O. NORTH. (Wyo. Expt. Sta.). (*U. S. Egg and Poultry Mag., 44 (1938), No. 4, pp. 224–227, 240, 242, fig. 1*).—A comprehensive review, with 30 references cited.

Development and growth of chick embryos in fresh and stored eggs [trans. title], L. KAUFMAN (*Arch. Geflügelk., 12 (1938), No. 3, pp. 65–77, figs. 6; Eng. abs., pp. 76, 77*).—A marked increase in the rate of embryo mortality was observed as the length of time eggs were held in cold storage before incubation increased. Greatest mortality occurred during the first days of incubation. Storage eggs showed a lower moisture content of egg white and a higher moisture content of yolks than fresh eggs, and the moisture content of embryos was higher in stored than in fresh eggs. The embryos in fresh eggs were always considerably larger after 1 and 2 weeks of incubation, while the percentage rate of embryonic growth was more rapid in storage eggs during the second and third weeks of incubation. Embryonic growth started about 24 hr. later and hatching occurred about 1 day later in stored than in fresh eggs.

Egg quality as related to the individual bird, F. P. JEFFREY (*New Jersey Stas. Hints to Poultrymen, 25 (1938), No. 6, pp. 4*).—This is a brief discussion of the extent to which egg size and shape, the color and physical condition of the eggshell, the color and consistency of albumin, and the occurrence of meat and blood spots are individual characters and are influenced by heredity.

DAIRY FARMING—DAIRYING

[Dairy cattle investigation in Tennessee], B. P. Hazlewood (*Tennessee Sta. Rpt. 1937, p. 53*).—From the West Tennessee Substation results are presented on the use of an all-roughage ration (pasture, alfalfa hay, and silage) v. the same type of roughage and grain for milking cows.

[Dairy cattle and dairy products investigations in Vermont] (*Vermont Sta. Bul. 438 (1938), pp. 21–24*).—Progress reports (E. S. R., 78, p. 239) are presented for the following studies: The calcium and phosphorus balances of milking cows, the effects of feeding vitamins A and D in concentrated cod-liver oil with different grades of hay to dairy calves, the digestibility and feeding value of silages, factors affecting the accuracy of the methylene blue and resazurin tests for grading milk as to sanitary properties, and factors affecting the estimation of butterfat in milk by the Babcock and Mojonnier procedures.

Feeding value of hay crop silage, C. F. Monroe, C. C. Hayden, A. E. Perkins, W. E. Krauss, C. E. Knoop, and R. G. Washburn (*Ohio Sta. Bimo Bul. 194 (1938), pp. 155–164, figs. 3*).—The results are reported for a series of feeding trials with milking cows, using silages in various combinations in the ration. Three trials in which a mixed corn and soybean silage as a sole roughage was compared with corn silage and alfalfa hay and two trials in which A. I. V. alfalfa-clover silage was compared with alfalfa hay when each was fed in combination with corn silage gave evidence that these hay silages may replace sun-cured hay in the winter rations. The cows receiving silage as a sole roughage throughout the winter feeding period showed no ill effect, and milk production per pound of dry matter intake was very similar on the two types of rations. Alfalfa-molasses silage proved to be a valuable supplement for maintaining milk production during the summer period when a shortage of pasture occurred. Corn silage proved more palatable than any of the hay silages when all were offered free-choice to dairy cows.

The protein supply for dairy cows, A. C. M'Candlish (*West of Scot. Agr. Col., Res. Bul. 6 (1938), pp. 46*).—A comprehensive review of the literature is presented, and the results of a series of 15 feeding trials conducted over a period of 12 yr. comparing the effectiveness of different sources and combinations of protein concentrates and various levels of protein feeding for dairy cattle are summarized.

Feeding and care of calves, R. R. Thalman (*Nebraska Sta. Circ. 58 (1938), pp. 22, figs. 7*).—This is a popular publication discussing the nutritive requirements of the growing beef calf, suitable sources of nutrients and rations for calves, and desirable management practices.

The vitamin D requirement of dairy calves, S. I. Bechdel, N. W. Hilston, N. B. Guerrant, and R. A. Dutcher (*Pennsylvania Sta. Bul. 364 (1938), pp. [2]+26, figs. 9*).—The results of two series of experiments are summarized. In the second series, from which the principal conclusions are drawn, four groups of calves, respectively, received 0, 100, 300, and 500 U. S. P. units of vitamin D daily per 100 lb. of live weight as supplements to a low vitamin D basal diet from birth to about 7 mo. of age, vitamin D being supplied from cod-liver oil for one-half of each group and from irradiated yeast for the other half. The responses were measured by blood calcium and phosphorus determinations, X-ray observations on the epiphyseal cartilage at the distal end of the ulna, line tests on the distal end of the ninth rib, and bone ash determinations. The amount of Vitamin D supplied in the basal diet (about 135 U. S. P. units daily per 100 lb. of live weight) was not sufficient to prevent rickets in calves. About 300 U. S. P. units per day per 100 lb. of live weight was the minimum protective level for growth, well-being, and proper calcification of bones of calves 7 mo. of age. Unit for unit of vitamin D, cod-liver oil and irradiated yeast were equally effective sources of this factor for calves.

Storage of vitamin D in the tissues of growing calves, N. B. GUERRANT, R. A. MORCK, S. I. BECHDEL, and N. W. HILSTON. (Pa. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 5, pp. 827–831*).—In connection with the above study, the amount of vitamin D stored in the blood and livers of the calves was determined. The concentration of the antirachitic factor per unit of weight was approximately equal in these two tissues, ranging from 7 to 21 U. S. P. units per 100 cc of blood and from 11 to 22 units per 100 g of liver. Apparently only a small percentage of the vitamin D ingested is stored in the blood and liver.

Influence of age of dairy cattle and season of the year on the sex ratio of calves and services required for conception, R. F. MORGAN and H. P. DAVIS (*Nebraska Sta. Res. Bul. 104 (1938), pp. 19*).—The breeding data of the University of Nebraska dairy herd for a period of 38 yr. furnished the basis for this study. Considering bulls of all ages mated to 2,090 cows of all ages, 2.21 services were required per conception over this period. Bulls under 2 yr. of age showed the smallest number of services per conception, while from 2 yr. through 8 yr. of age the number of services varied but little. Little information was available on bulls over 8 yr. of age. Heifers under 2 yr. of age required more services per conception than any other age group of cows, while cows from 2 to 13 yr. of age showed little variation in this respect. Two-year-old bulls mated to 2-year-old cows showed the smallest number of services per conception of any age combinations. Bulls 3 yr. old and over when mated to heifers under 2 yr. of age required a relatively large number of services per conception. Slightly more services per cow were required from May to October than from November to April, with the lowest number required in December and the greatest in September. The sex ratio of all calves dropped was 53.75 percent males and 46.25 percent females, with more males than females being born in each month of the year except November. The average percentage of abortions over this period was 12.58.

A diagrammatic method of presenting the history of reproduction in a dairy herd, S. W. MEAD. (Univ. Calif. coop. U. S. D. A.). (*Jour. Dairy Sci., 21 (1938), No. 6, pp. 283–287, figs. 3*).—A diagrammatic scheme for showing the history of reproduction in dairy herds is presented, by use of which the reproductive history of an entire herd over a long period may be seen at a glance and yet the individual performance of each animal in the herd can be followed easily.

Growth and development, with special reference to domestic animals.—XLIX, Growth, milk production, energy metabolism, and energetic efficiency of milk production in goats, S. BRODY (*Missouri Sta. Res. Bul. 291 (1938), pp. 64, figs. 21*).—Continuing these studies (E. S. R., 80, p. 85), growth data on a limited number of goats indicate that they approached maturity from two to three times as rapidly as dairy cows, but that the two species follow a very similar growth trend when adjusted to the same age equivalent. The rate of decline in milk production while quite variable in the animals studied, tended to be more rapid in goats than in dairy cattle. The gross energetic efficiency of milk production in goats was about 35 percent or of the same order as that in good dairy cows and in rats. A statistically significant annual metabolic rhythm was observed, with the maximum rate occurring in early spring at the trough of the breeding season. During active growth, heat production increased at about the ⅔ power of body weight. Heat production declined after feeding and was approximately 30 percent above the basal level 12 hr. after feeding.

Bound water and its relation to some dairy products.—II, Factors affecting the bound water content of some dairy products, C. D. Dahle and H. Pyenson. (Pa. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 7, pp. 407–420*).—Continuing this study (E. S. R., 79, p. 385), the effect of pH, pasteurization, homogenization, freezing, and the addition of stabilizing salts on the bound water content of certain dairy products was determined. A casein sol and concentrated milk plasma had the greatest bound water contents at pH 6.6 to 6.7 and 6.2 to 6.4, respectively, with these values tending to decrease if the pH was either increased or decreased and also as the concentration of the casein sol increased. Increasing temperatures reduced the bound water content of concentrated milk plasma, of the fat globule membrane, and of pure milk phospholipids. The bound water in cream was decreased slightly by pasteurization at 143° F. for 30 min. and was further reduced by homogenization. Single-stage homogenization decreased the bound water in ice cream mixes, but dual homogenization caused a destruction of the clumps, which increased the stability of the proteins and also the amount of bound water. The freezing of skim milk and condensed milk over long periods reduced protein stability and the amount of bound water. The addition of stabilizing salts increased and destabilizing salts decreased protein stability and bound water in concentrated milk plasma and cream.

Interrelations of milk-fat, milk-protein, and milk-energy yield, W. L. Gaines and O. R. Overman. (Ill. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 6, pp. 261–271, figs. 3*).—Based on the 305-day partial lactation records of 130 cows, formulas are presented for estimating the protein content of milk from the percentage of butterfat and the total energy yield of milk from the butterfat and protein content. The coefficients of correlation between the actual and estimated yields of protein and total energy are as follows: For total energy based on butterfat content $r=0.985$, for protein yield based on butterfat content $r=0.755$, and for total energy based on protein content $r=0.832$. The biological significance of these interrelationships is discussed.

The chemical composition and properties of normal and rancid Jersey milk, II, III, R. Reder. (Okla. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), Nos. 6, pp. 249–260, figs. 3; 7 pp. 369–377, figs. 2*).—Continuing this report (E. S. R., 79, p. 385), two additional phases of this study are described.

II. *Fat, total solids, and protein content.*—Data are presented on the fat, total solids, and protein content of milk samples from individual cows in a Jersey herd, with a comparison of the amounts of these constituents present in normal and rancid samples produced during the same period of lactation. In general the rancid samples had a higher content of each of these constituents, including higher casein and higher lactalbumin contents, than did normal milk produced at a comparable stage of lactation. The relatively high content of these constituents appeared to be characteristic of all milk produced by those individuals whose milk was frequently rancid.

III. *Titratable acidity, hydrogen-ion concentration, and lipase content.*—Analysis of the milk samples from individual cows in this Jersey herd taken at intervals throughout the lactation period showed that rancid samples generally had a higher titratable acidity and lower pH value than normal milks produced at the same stage of lactation. All milk samples had definite though small lipolytic activity, with definitely rancid samples showing greater activity than normal milks.

The lipase, fatty acid, and cholesterol content of cow's blood in relation to the production of rancid milk, R. REDER. (Okla. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 8, pp. 475–481, figs. 2*).—Blood studies on the above-described group of cows indicated that the fatty acid content of the blood serum normally showed a sharp increase during the first 3 mo. of lactation, followed by a gradual decline to the end of the lactation period; also blood fatty acids increased markedly when cows were changed from dry feed to green pastures at any stage of lactation. The cholesterol content of the blood showed a similar but less pronounced rise in early lactation, followed by a slight gradual decline. The production of rancid milk could not be explained on the basis of fatty acid and cholesterol content or lipolytic activity of the blood, since those constituents followed like trends for cows producing normal and rancid milks at corresponding periods of lactation.

The source of vitamin D in summer milk, J. E. CAMPION, K. M. HENRY, S. K. KON, and J. MACKINTOSH (*Biochem. Jour., 31 (1937), No. 1, pp. 81–88, fig. 1*).—In experiments at the National Institute for Research in Dairying, four groups of experimental cows on test from May 1 to June 30 were handled as follows: Group 1, kept indoors on dry winter ration; group 2, allowed exposure to sun and skyshine but fed dry winter rations; group 3, kept outdoors on pasture; and group 4, kept indoors but fed freshly cut grass. Near the end of the experimental period the yield of vitamin D was 8.3, 26, 17, and 5.3 International Units per kilogram of milk, respectively, and the ratios of vitamin D in the outdoor and indoor groups were about 3:1 on each type of ration, indicating that direct exposure of the cows to sun and skyshine contributed all and pasture none of the increase in the vitamin D potency of the summer milk.

The effect of feeding mangels or dried beet pulp to cows on the development of oxidized flavor in milk, J. C. HENING and A. C. DAHLBERG. (N. Y. State Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 7, pp. 345–352*).—A comparison of the susceptibility to oxidized flavor development of milk samples from 13 Jersey cows receiving mangels in addition to an ordinary winter ration with samples from a similar group not receiving mangels and of milk from 4 Holstein cows receiving dried beet pulp with that of a similar group not receiving beet pulp led to the conclusion "that the feeding of mangels or beet pulp in no way prevented or increased the susceptibility of milk to the development of oxidized flavor."

Modification of the Bloom gelometer for use in the determination of the curd tension of milk, R. E. L. BERGGREN (*Jour. Dairy Sci., 21 (1938), No. 7, pp. 353–359, figs. 2*).—Certain modifications of the Bloom gelometer are described by which this apparatus may be adapted for use in the estimation of the curd tension of milk. The results with this equipment closely agreed with those by the Hill apparatus when pepsin-calcium chloride was used as a coagulant, and it proved especially useful in the measurement of very low curd tensions. The use of hydrochloric acid-pepsin mixtures as a coagulant gave unsatisfactory results with this equipment.

Soft curd milk produced with pancreatic concentrate, V. CONQUEST, A. W. TURNER, and H. J. REYNOLDS (*Jour. Dairy Sci., 21 (1938), No. 7, pp. 361–367*).—The methods described for reducing the curd tension of milk consisted in adding specially prepared pancreatic enzymes to cows' milk in dilutions ranging from 1–6,500 to 1–50,000, allowing a brief incubation period, and then inactivating the enzyme by pasteurization either at 62.5° C. for 30 min. or by the flash method at 73° to 76°. The curd tension of milk thus treated was consistently reduced to a range of 20 to 30 g (Hill method). The calves fed the treated milk retained the curds in their stomachs for a shorter time, and the curds formed were softer than when normal pasteurized milk was fed. This treatment had little effect on the phosphorus, calcium, magnesium, protein, or formol titration values of the milk.

A plant study of damaged and defective milk bottles, C. T. Roland and H. A. Trebler (*Jour. Dairy Sci., 21 (1938), No. 6, pp. 275–281, fig. 1*).—Based on an extensive survey in two large milk-bottling plants, data are presented on the relative importance of impact shock breakage and damage, thermal shock, etched surface, and manufacturing flaws as causes for milk bottle rejections in the plants. The rejection percentages were in the increasing order of pints, half-pints, quarts, and gills, with an apparent relationship between low percentage rejection and few trips per bottle in the case of pints.

The dairyman's interest in the single-service paper container, J. R. Sanborn (*Farm Res. [New York State Sta.], 4 (1938), No. 4, p. 12*).—Trends in the use of paper containers for milk distribution and the sanitary properties of such containers are briefly discussed.

Specific heat and the physical state of the fat in cream, A. H. Rishoi and P. F. Sharp. (Cornell Univ.). (*Jour. Dairy Sci., 21 (1938), No. 7, pp. 399–405, figs. 3*).—Using the method of mixtures (warm water poured into colder milk or cream), the specific heat of cream at different temperature levels was determined. This method proved reliable within the temperature range in which a change in the relative amounts of crystalline and liquid fat occurred. When cream was cooled to temperatures within a range of 0° to 20° C., the adjustment between the liquid and crystalline phases was complete in about 4 hr. The average specific heat for milk fat in the globules was as follows: From 0° to 5°, 0.89; 5° to 10°, 0.95; 10° to 15°, 1.43; 15° to 20°, 1.85; 20° to 25°, 0.575; and from 25° to 40°, 0.475, for milk samples produced in October and November. The specific heat of milk fat produced in June averaged somewhat lower than for October-produced milk.

Coffee as a factor in the feathering of cream, P. H. Tracy and W. J. Corbett. (Univ. Ill.). (*Jour. Dairy Sci., 21 (1938), No. 8, pp. 483–495*).—A study was made of 26 brands of coffee with reference to factors affecting the feathering of cream in hot coffee. The pH of the brew appeared to be the principal governing factor, and the various brands showed differences in this respect. Methods of curing the bean and concentration of the coffee in the brew had no definite relationship to feathering, and the methods of brewing had only slight influences. Increasing the length of the roasting period increased the pH of coffee and decreased the feathering tendency. Brew made from aged coffee was lower in pH and more likely to produce feathering than that from fresh stock. Adding cream to the coffee resulted in less feathering than when coffee was added to the cream, and rapid mixing of the cream and coffee reduced the feathering tendency.

The keeping quality of butters.—I, The rates of deterioration of butters made from creams of different acidities and stored at various temperatures, G. E. Holm, P. A. Wright, W. White, and E. F. Deysher. (U. S. D. A.). (*Jour. Dairy Sci., 21 (1938), No. 7, pp. 385–398, figs. 4*).—Butters used in these studies were churned from pasteurized fresh cream with an acidity of from 0.12 to 0.14 percent and from pasteurized creams adjusted to approximately 0.2, 0.3, and 0.4 percent acidity. Each churning was divided into five lots, which were stored at 20°, 10°, 0°, —10°, and —17° C., respectively. Samples were scored and tested for peroxide value and bleaching time at intervals during storage. The sweet cream butters and those from cream of 0.2 percent acidity were practically identical in keeping quality at comparable temperatures, while butter from cream of an acidity of 0.3 percent or more deteriorated in quality more rapidly. Below a score of 89 the drop in score did not correlate directly with the magnitude of chemical changes which took place, although the oxidation reaction appeared to be the underlying cause of various changes which were responsible for loss in score. There was a constant increase in the length of time required for butter to lose score, as storage temperatures decreased from 20° to —10° but showed little difference at —10° to —17°.

The pH of blue or American Roquefort cheese, S. T. Coulter, W. C. Combs, and J. S. George. (Minn. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 6, pp. 273, 274*).—Determinations of the pH values of 60 lots of blue cheese at intervals during the ripening process gave evidence that acidity reached a maximum of about pH 4.7 within 24 hr. after manufacture. After salting the acidity of the cheeses decreased rather rapidly until they were pierced to admit air, at which time the acidity increased sharply for a brief period and then again gradually declined to a pH of about 6.5 at the end of the third month. Beyond this time acidity tended to increase gradually to pH 5.7 at the end of a 9-mo. ripening.

Comparison of tryptone-glucose-skimmilk and standard nutrient agars as media for determining the bacterial count in ice cream, V. D. Foltz and W. H. Martin. (Kans. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 6, pp. 289–294*).—Bacterial counts were obtained on 279 samples of commercial ice cream, using standard nutrient agar at 37° C. incubation temperature and tryptone-glucose-skim milk agar at 37° and 32°. The logarithmic average of counts obtained on tryptone agar at 37° and 32° was 137 and 192 percent, respectively, of that obtained by the standard method, and the arithmetic average of tryptone agar counts was 132 and 156 percent, respectively, of the standard agar count. The mean ratios of tryptone agar counts to standard agar counts were 2.46 and 4.11 and the median ratios 1.25 and 1.52 at 37° and 32°, respectively. These latter values compared closely with the arithmetical average counts. Apparently manufacturers will be required to exercise greater sanitary precautions in the making of ice cream if the tryptone agar and 32° incubation temperature are generally adopted.

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[Contributions on animal pathology] (*Internatl. Assoc. Milk Dealers, Proc., 30 (1937), Prod. Sect., pp. 3–27, 60–84, figs. 15*).—The following contributions were presented at the annual convention of the International Association of Milk Dealers held at Dallas, Tex., in October 1937: The Effect of Mastitis on the Udder and Its Product, by T. S. Sutton (pp. 3, 4); Pathological Changes Occurring in the Bovine Udder Due to Infectious Mastitis, by W. T. Miller (pp. 5–18); The Composition of Milk as Affected by Mastitis, by C. H. Whitnah, W. J. Caulfield, A. C. Fay, and V. D. Foltz (pp. 19–27) (Kans. Expt. Sta.); Bang's Disease in Cattle, by A. E. Wight and J. M. Buck (pp. 60–72); and Bang's Disease—Status of Vaccination, by W. Wisnicky (pp. 72–84).

A survey of the animal parasites with transitory or stationary occurrence in the liver of ruminants and swine, H. O. Pedersen (*Skand. Vet. Tidskr., 28 (1938), No. 6, pp. 345–362; Eng. abs., p. 362*).—The survey reported relates mainly to the parasites *Paramphistomum cervi, Dicrocoelium lanceatum, Opisthorchis felineus, Fasciola hepatica, Taenia hydatigena, Echinococcus granulosus,* and *Linguatula serrata,* and the lesions caused in the liver.

[Livestock diseases reports, Nos. 12 and 13], M. Henry (*N. S. Wales Dept. Agr., Livestock Diseases Rpts. 12 (1936), pp. 24, fig. 1; 13 (1937), pp. 24*).—The occurrence of and control work with diseases of livestock during the years ended June 30, 1936 and 1937, are reported (E. S. R., 75, p. 397).

Report of the government veterinary surgeon, M. Crawford (*[Ceylon] Actg. Dir. Agr., Admin. Rpt., 1936, pt. 4, Ed., Sci., and Art. (D), pp. 70–75*).—The occurrence of and control work with infectious and parasitic diseases in livestock, particularly foot-and-mouth disease and rabies, are noted.

Clinical allergy, L. Tuft (*Philadelphia and London: W. B. Saunders Co., 1937, pp. 711, [pls. 5], figs. [65]*) —This work, dealing with the subject in four sections (general principles (pp. 17–127), etiologic types (pp. 128–247), clinical manifestations (pp. 248–443), and allergic dermatoses and allergy in relation to the specialties (pp. 444–582)), is presented with a 35-page systematically arranged bibliography.

Toxicity in the leaves of Rhododendron californicum Hook, I, F. A. Gilfillan and C. Otsuki (*Jour. Amer. Pharm. Assoc., 27 (1938), No. 5, pp. 396–398*).—Experiments are reported in which extracts from the dried leaves of *R. californicum* were fed to the guinea pig and rabbit.

Bacteriological atlas, R. Muir (*Edinburgh: E. & Livingstone, 1927, pp. 134, pls. 60*).—This atlas consists of a series of colored plates illustrating the morphological characters of pathogenic micro-organisms.

Muir's bacteriological atlas, C. E. van Rooyen (*Edinburgh: E. & S. Livingstone, 1937, 2. ed., pp. XVI+90, pls. [42]*).—An enlarged edition of the atlas above noted in which the text has been rewritten.

Sulphanilamide in the treatment of actinomycosis, O. Walker (*Lancet [London], 1938, I, No. 22, pp. 1219, 1220*).—The remarkable improvement which followed the administration of sulfanilamide led to the report of the case of actinomycosis here presented. It is recommended that the remedy be given a trial in the treatment of this disease.

Chemotherapy of pneumococcal and other infections with 2-(p-aminobenzenesulphonamido) pyridine, L. E. H. Whitby (*Lancet [London], 1938, I, No. 22, pp. 1210–1212*).—The author has found that "(1) 2-(*p*-aminobenzenesulfonamido) pyridine is chemotherapeutically active in experimental infections in mice against pneumococci of types I, II, III, V, VII, VIII, and especially against types I, VII, and VIII; (2) it appears to exert a definite action on the capsule of the pneumococcus; (3) it is as active as sulfanilamide against hemolytic streptococcus and meningococcus; [and] (4) it has a low toxicity for animals and does not produce porphyrinuria in those tested."

A study of pseudotuberculosis rodentium recovered from a rat, V. H. Haas (*Pub. Health Rpts. [U. S.], 53 (1938), No. 25, pp. 1033–1038*).—The disease pseudotuberculosis rodentium, due to *Bacillus pseudotuberculosis*, recovered from a rat (*Rattus norvegicus*), was transmitted to guinea pigs and other rats by inoculation with tissue of the affected rodent. The attempt to transmit this disease from guinea pig to guinea pig by the oriental rat flea was not successful. There was no indication that the organism of pseudotuberculosis might give rise to variants which would be identical with *Pasteurella pestis;* even in those instances in which guinea pigs died of pseudotuberculosis in a week or less, both disease and causative organism remained true to type and could be distinguished from plague and *P. pestis*, respectively.

An unusual strain of rabies virus in a vampire bat, J. L. Pawan (*Ann. Trop. Med. and Parasitol., 32 (1938), No. 1, pp. 35–38*).—Report is made of a strain of rabies virus found in the vampire bat in Trinidad which was capable of causing death in rabbits in the abnormally short period of 2 days.

The spread of ephemeral fever (three-day sickness) in Australia in 1936–37, H. R. Seddon (*Austral. Vet. Jour., 14 (1938), No. 3, pp. 90–105, figs. 3*).—Studies of ephemeral fever, which first came to attention in Australia in 1936, have shown that it is not ordinarily spread by the movement of affected cattle but through an agency capable of crossing several miles of water. A discussion of this paper under the heading Ephemeral Fever—Its Introduction, Spread, and Economic Importance in New South Wales, by D. F. Gray, is included (pp. 101–105).

A comparative study of various agents in the chemotherapy of rat trichomoniasis, P. M. Nelson and A. L. Tatum. (Univ. Wis.). (*Jour. Pharmacol. and Expt. Ther., 63 (1938), No. 2, pp. 122–142*).—A number of drugs, including 10 pentavalent arsenicals, 1 trivalent arsenical, and chiniofon, were found by the authors to have favorable oral chemotherapeutic indices in rat trichomoniasis. Five pentavalent arsenicals had favorable therapeutic indices when administered either intramuscularly or intravenously. One pentavalent arsenical (carbarsone) was effective in tolerated doses when given by the intramuscular route but not when given by the intravenous route. For those drugs which cure by any of the routes tried, the oral was by far superior to the other two, and the intramuscular was superior to the intravenous route.

The use of Prontosil in diseases of small animals [trans. title], J. G. Ojemann (*Tijdschr. Diergeneesk., 65 (1938), No. 17, pp. 885–888; Ger., Eng., Fr. abs., p. 888*).—The author has found Prontosil to be of value in the treatment of distemper and with Lentin (Merck) of pseudomembranous enteritis in cats, and has observed good results to follow its use in cases of cystitis, endometritis, acne, articular wounds, and laryngitis.

Hemorrhagic septicemia: The significance of Pasteurella boviseptica encountered in the blood of some Florida cattle, D. A. Sanders (*Florida Sta. Bul. 322 (1938), pp. 24, fig. 1*).—In the course of investigations of *P. boviseptica*, an organism frequently encountered at autopsy in the blood and internal organs of Florida cattle, exposure by ingestion and nasal spray failed to produce septicemia. This bacterium was recovered from the nasopharynx of cattle, showing no gross lesions, 3 mo. following such exposure. It was demonstrated in the tracheal exudate of cattle that died from infection with the filtrable virus of pseudorabies and was also demonstrated in the blood and internal organs shortly after death due to *Anaplasma marginale* infection and to *Crotalaria spectabilis* poisoning. It was found that *P. boviseptica*, colon type, and other saprophytic organisms frequently may be isolated from the blood stream of cattle showing advanced symptoms of bronchopneumonia and pulmonary emphysema which develop incident to railway transportation.

P. boviseptica was the predominating bacterial species isolated from diseased lungs of calves affected with enzootic pneumonia. The micro-organism colonizes in the respiratory passage of young calves and exerts pathogenic action under influences of predisposing factors prevalent on affected premises. This type of pneumonia may be controlled by employing sanitary methods of rearing calves. *P. boviseptica* produced acute and chronic pasteurellosis in the fish crow (*Corvus ossifragus*) when the organism was instilled into the nasal cleft. All strains of *P. boviseptica* employed in these investigations were lethal for rabbits in amounts of 0.001 cc of a 24-hr. bouillon culture when injected intraperitoneally. "In the light of present experimental evidence, *P. boviseptica* occurring in carcass material of cattle cannot be credited as having any special etiological significance in this section."

A list of 14 references to the literature is included.

The worst enemy of the dairy industry—mastitis (mammitis, garget), J. M. Brannon. (Univ. Ill.). (*Milk Plant Mo., 26 (1937), Nos. 8, pp. 53, 56, 58, 60; 9, pp. 53, 54, 56, 58*).—A comprehensive presentation of the present-day knowledge of mastitis, with suggestions for restriction of its spread.

Chronic mastitis of the dairy cow, E. G. Hastings (*Internatl. Assoc. Milk Dealers, Assoc. Bul. 24 (1936), pp. [1]+21*).—A practical summary of the present knowledge of this affection.

Pyelonephritis in cattle, C. C. Palmer. (Univ. Del.). (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 4, pp. 241–243*).—Report is made of a study of the spread of specific infectious cystitis and pyelonephritis under conditions of natural infection in several large herds of dairy cattle in Delaware. The disease has spread very slowly in all of the herds and has not been of great economic importance. It is pointed out that the clinical symptoms do not become pronounced until the pathological changes are well advanced, and that after the onset of acute clinical symptoms the course of the disease is usually rapid. One case, regarded as being fairly typical of the syndrome presented in this disease, is described in detail.

Duration of immunity following goat-virus vaccination in cattle, R. N. Naik (*Indian Jour. Vet. Sci. and Anim. Husb., 8 (1938), No. 2, pp. 103–112, figs. 6*).—In work in the Bombay Presidency four cattle which were vaccinated with goat blood virus 5 yr. before were artificially infected with virulent rinderpest virus. Every animal was found to possess solid immunity against rinderpest, thus showing that the duration of immunity conferred by goat blood virus vaccination is more than 5 yr.

On the treatment of Babesia bigemina infection in cattle in India, J. A. Idnani (*Indian Jour. Vet. Sci. and Anim. Husb., 7 (1937), No. 4, pp. 273–287; also in Indian Vet. Jour., 14 (1938), No. 4, pp. 311–331*).—In routine practice a large number of failures resulted in the control of cattle tick fever during rinderpest work with trypan blue. While a proprietary mixture (Akiron R) was found to be entirely valueless as a prophylactic agent, it proved very successful when applied as a remedial measure. The maximum effective dose of the drug was demonstrated to be 1 cc of a 5-percent solution per 100-lb. body weight. Its curative effect proved sufficiently lasting. The findings appear to confirm those of Legg in Australia (E. S. R., 77, p. 697).

Some ways to detect and prevent the spread of trichomoniasis in cattle, C. H. Case and W. O. Keefer (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 4, pp. 239, 240, fig. 1*).—These notes relate to the authors' findings in the search for a reliable method of detecting trichomonads in recently purchased bulls. This infection is said to be the cause of great loss, that on a single farm in 1937 being estimated at $10,000.

Cattle tuberculosis in Canada, I, II, G. Brook (*Vet. Jour., 93 (1937), Nos. 8, pp. 285–294; 9, pp. 317–330, pls. 4, fig. 1*).—The history of control work with bovine tuberculosis in Canada is reported upon.

Some notes on Sarcosporidia in Virginia, I. D. Wilson and R. McDonald. (Va. A. and M. Col.). (*Jour. Parasitol., 24 (1938), No. 3, pp. 249, 250*).—In an examination made of cattle in Virginia, all but 4 of 35 animals were found infected with Sarcosporidia. Sections made from the hearts of 27 sheep resulted in the finding of 8 to be infected. No cysts were found in sections from calf hearts. All parasites studied had the same general appearance in cyst and cyst contents. No three-layered membrane was found, and in only a few cases in cattle were the trabeculae seen dividing the cyst into compartments. It is pointed out that while the examinations were superficial, since only a small section of the heart from each animal was studied, they serve as an index to the prevalence of the disease in cattle and sheep in Virginia.

Ovine and bovine listerellosis in Illinois, R. Graham, G. L. Dunlap, and C. A. Brandly (*Science, 88 (1938), No. 2277, pp. 171, 172*).—The authors make reference to three natural outbreaks, two of ovine and one of bovine encephalitis and/or encephalomyelitis associated with *Listerella*. The first outbreak which came to the attention of the Illinois Experiment Station occurred in De Witt County in a group of 250 feeder lambs that had been purchased 6 weeks earlier at a central market; of these, 30 died or became moribund and were destroyed and a few mildly affected lambs apparently made a complete recovery. The second outbreak, which occurred in a flock of 100 breeding ewes in De Witt County and so far as determined had no connection with the first outbreak, resulted in a mortality of 6 ewes. The third outbreak showing an encephalitic and/or encephalomyelitic syndrome was observed in a group of 60 yearling feeder steers in Piatt County, the affected animals becoming prostrate and remaining comatose for 3 or 4 days before death. Post-mortem examination of naturally affected lambs and ewes in the two outbreaks did not reveal any marked gross pathological changes in the internal organs. An examination of stained sections from the brain of naturally affected lambs and cattle showed polymorphonuclear and mononuclear foci in the stem and in the white matter of the cerebrum and cerebellum, together with perivascular cuffing with mononuclear cells and a mononuclear meningitis.

"The pathogenic properties of *Listerella* strain isolated from one outbreak in sheep have been established by artificial exposure of healthy lambs, calves, chickens, guinea pigs, rabbits, and rats, while cultural and biochemic properties of the strains from the three outbreaks described herein conform to the genus *Listerella*."

The control of toxic paralysis (botulism) in sheep and cattle, H. W. Bennetts and H. T. B. Hall (*Jour. Dept. Agr. West. Austral., 2. ser., 14 (1937), No. 4, pp. 381–386*).—This contribution calls attention to the fact that vaccination with botulinus toxoid affords a very high degree of resistance to toxic paralysis in both sheep and cattle, as has been demonstrated by experiments and field trials. It is recommended that at least 2 mo. elapse between the first and second inoculations with toxoid, the doses for sheep being 1 and 5 cc and for cattle 2 and 10 cc.

Botulism of sheep and cattle in Western Australia: Its cause and its prevention by immunization, H. W. Bennetts and H. T. B. Hall (*Austral. Vet. Jour., 14 (1938), No. 3, pp. 105–118*).—Botulism of sheep and cattle in Western Australia is said to result from ingestion of material, generally carrion, containing the toxin of *Clostridium botulinum* type C. "Type D, however, was cultivated from fodder (hay and chaff) on two occasions. Experimental evidence indicates that rabbit carrion, considered to be the commonest source of toxin, may be very highly toxic at the stage at which it is attractive to sheep. It is possible for sheep to ingest carrion so highly toxic that from 3 to 5 g. may produce a fatal result. The influence of several factors on the toxicity of rabbit carrion is discussed. There is some evidence that drinking water contaminated with carrion may be a source of intoxication for stock. Experiments with artificially contaminated water are reviewed. Experimental evidence indicates that the addition of 0.2 percent of quicklime would render highly contaminated water innocuous to stock.

"Vaccination with botulinum toxoid (alum precipitated) on two occasions, with at least a 2-month period between inoculations, confers on both sheep and cattle a high degree of immunity and offers a safe and efficient means of controlling the disease. It is difficult to conceive of protected animals ingesting sufficient toxin at one time, even in the most highly toxic carrion investigated, to break down the immunity thus conferred. The immunity appears to be of long duration, but as the maintenance of a high degree is desirable, it is advisable that immunized animals be given one 'refreshing' dose of toxoid each year. A preliminary experiment indicates that a single dose of toxoid may confer a fairly high degree of immunity on sheep."

Some feedlot diseases of lambs, F. Thorp, Jr. (Colo. Expt. Sta.). (*Vet. Med., 33 (1938), No. 10, pp. 442–445, figs. 2*).—A practical account of feed lot diseases of lambs, namely, those resulting from shipping and those due to poor feeding practices.

Dysentery of new-born lambs, H. Marsh, H. Welch, and E. A. Tunnicliff (*Montana Sta. Circ. 153 (1938), pp. 8, figs. 6*).—A practical summary based on Bulletin 361 (E. S. R., 80, p. 108).

Effect of infestation with the nematode Cooperia curticei on the nutrition of lambs, J. S. Andrews. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *57 (1938), No. 5, pp. 349–361, fig. 1*).—In a paired feeding experiment the nutrition of eight cross-bred Hampshire-Southdown wether lambs, four of which were experimentally infested with *C. curticei*, was studied. Although the infested lambs remained in excellent nutritional condition and presented no clinical symptoms of parasitic infestation, they showed a decrease in their ability to convert their feed into gain in weight. Evidence was presented to show that this decrease in the efficiency of the infested lambs was due to an increase in energy metabolism rather than to a decrease in the apparent digestibility coefficients of the various components of the ration, or to interference with the nitrogen and mineral metabolism. This increased energy metabolism of the infested lambs was accounted for by the nervous excitation of the host due to the irritation of the intestinal mucosa by the worms, by the production of areas of inflammation by the larvae in the mucosa, and by the possible, although undemonstrated, accumulation of guanidine in the blood of the infested lambs.

Observations incident to an outbreak of equine encephalomyelitis in the Bitterroot Valley of western Montana, H. R. Cox, C. B. Philip, H. Marsh, and J. W. Kilpatrick (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 4, pp. 225–232, figs. 4*).—Observations of two epizootics in the summer of 1936, in the first of which two strains of the western virus were discovered and identified, are reported. In the first epizootic there were 57 cases reported from 49 ranches having a total population of 485 horses. The morbidity was 11.75 percent and the mortality 35.09 percent. During this outbreak a total of 969 horses were treated simultaneously with active virus-immune serum. The second was an epizootic of undetermined nature, showing a picture differing in important features, that occurred about a month after the first had subsided. In the later outbreak 36 cases were reported from 27 ranches, 32 having been vaccinated against encephalomyelitis of which 28 died. All attempts to establish the identity of the etiological agent of the later epizootic resulted in failure.

A note briefly reporting observations of the appearance of the disease in the Bitterroot Valley in 1937, in which 29 cases were reported from 25 ranches with a mortality of 9, is appended.

Immunization against equine encephalomyelitis with chick embryo vaccines, J. W. Beard, H. Finkelstein, W. C. Sealy, and R. W. G. Wyckoff (*Science, 87 (1938), No. 2265, p. 490*).—Experiments conducted in continuation of the work previously noted (E. S. R., 79, p. 249) are reported. The immunizing capacity of the formolized embryonic tissues of chicks was compared with that of the usual vaccines made from horse brain. The viruses of both the eastern and western strains of equine encephalomyelitis were shown to grow equally well in chick embryos. The virus concentration in these tissues was from 1,000 to 10,000 times greater than in the most infectious horse brain examined, and the chick vaccine proved to be correspondingly more effective as an immunizing agent.

Of 30 animals vaccinated with 8 different batches of eastern strain vaccine every one was solidly immune and survived the test inoculation of virus with no evidence of disease. All control animals succumbed promptly.

In experiments utilizing a group of 60 animals the western strain chick vaccine protected every tested guinea pig against 1,000 m. l. d. of virus, whereas no animal receiving the horse brain vaccine survived a test injection of 100 m. l. d. In preliminary experiments it has also protected every vaccinated horse against the intracerebral injection of enough virus to kill all the control animals.

In these experiments the vaccine consisted of a 10-percent diseased tissue suspension containing 0.4 percent formalin. A 1-percent chick vaccine has protected about 60 percent of the vaccinated animals.

Chick vaccine for equine encephalomyelitis, B. M. Lyon and R. W. G. Wyckoff (*Vet. Med., 33 (1938), No. 9, pp. 408, 409*).—A vaccine especially potent against equine encephalomyelitis was produced by the authors from formolized virus propagated upon chick embryos. "It is shown that this vaccine will give complete protection to both guinea pigs and horses injected intracerebrally with many lethal doses of western strain virus. The superiority of this new vaccine to that prepared from diseased horse brain is demonstrated in these experiments; all horse-brain vaccinated animals succumbed to encephalomyelitis as promptly as did the unvaccinated controls, whereas all 'chick' vaccinated animals were completely protected. Chick vaccine produces immunity so rapidly that its use may be recommended during epidemics, even though exposure may occur before the course of vaccination has been completed. To date during 1938 over 250,000 horses have been successfully vaccinated with this new vaccine."

On the colony-type of Streptococcus equi.—I, Comparison of the morphological, cultural, and biological characteristics between three isolated colony-types, S. Umeno (*Kitasato Arch. Expt. Med. [Tokyo], 15 (1938), No. 3, pp. 262–283, pl. 1, fig. 1*).—A report of experiments in which 87 strains of *S. equi* were employed. A list of 27 references to the literature is included.

A simple and practical test for the diagnosis of equine osteomalacia, A. K. Gomez and A. C. Gonzaga (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 4, pp. 233–235, figs. 4*).—A description is given of a test designed as an aid in the clinical diagnosis and prevention of equine osteomalacia.

[Contributions on diseases and parasites of poultry] (*Trudy Vsesoi͡uzn. Nauch. Issledov. Inst. Ptit͡sepromysh. [Moskva] (Trans. All-Union Inst. Poultry Indus.), 3 (1937), No. 1, pp. 206, figs. 24*).—Contributions presented, all in Russian, include the following: Fowl Pox, by A. P. Kiur-Muratov (Kjur-Mouratoff) (pp. 3–20, Eng. abs. pp. 19, 20); Immunity in Birds Vaccinated With the Pigeon Pox Virus, by E. A. Petrovskai͡a (Petrovskaya) (pp. 21–35, Eng. abs. p. 35); The Activity of the Pigeon Pox Virus as a Vaccine for Fowl Pox, by K. V. (C. W.) Panchenko (pp. 37–52, Eng. abs. pp. 51, 52); Fowl Pox Vaccine, by E. A. Petrovskai͡a (Petrovskaya) (pp. 53–66, Eng. abs. p. 66); The Agglutination Method and Antigen in Pullorum Disease of Fowls, by A. P. Kiur-

Muratov (Kjur-Mouratoff) and G. S. Zasedateleva (Zassedateljeva) (pp. 67–76, Eng. abs. p. 76); Fowl Typhoid, by K. V. (K. W.) Panchenko and P. O. Lı͡utikova (Ljutikowa) (pp. 77–92, Eng. abs. p. 92); The Durability in Preservation the Activity of Pullorum Antigen, by E. A. Petrovskaı͡a (Petrovskaya), K. V. (C. W.) Panchenko, and I. E. Golubev (J. E. Golubjeff) (pp. 93–103, Eng. abs. p. 103); The Diagnosis of Pullorum Disease in Fowls Alive, by I. E. Golubev (J. E. Golubjeff) (pp. 105–116, Eng. abs. p. 116); Neurolymphomatosis of Fowls, by E. A. Petrovskaı͡a (Petrovskaya) (pp. 117–143, Eng. abs. pp. 142, 143); Studies of Fowl Cholera (Pasteurellosis), by A. P. Kiur-Muratov (Kjur-Mouratoff) and G. S. Zasedateleva (Zassjedateleva) (pp. 145–164, Eng. abs. pp. 163, 164); Experimental Hints on Fowl Cholera (Pasteurellosis) (pp. 165–176, Eng. abs. p. 176) and Some Epizootologic Factors in Fowl Cholera (Pasteurellosis) (pp. 177–188, Eng. abs. p. 188), both by I. S. Zagaevskiĭ (J. S Zagajewsky); The Character of Bacterium Carrying in Fowl Cholera (Pasteurellosis), by P. I. (P. J.) Shatalin (Schatalin) (pp. 189–192, Eng. abs. p. 192); and Control of Parasites in Battery Brooders, by K. V. (C. W.) Panchenko and P. O. Lı͡utikova (Ljutikowa) (pp. 193–204, Eng. abs. p. 204).

Poultry practice, C. D. Lee. (Iowa State Col.). (*Vet. Med., 33 (1938), No. 8, pp. 360–369*).—A practical summary of information on the more common diseases of poultry.

Observations on the helminth parasites of poultry in Scotland, D. O. Morgan and J. E. Wilson (*Jour. Helminthol., 16 (1938), No. 3, pp. 165–172*).—Observations made in the course of a survey of helminth parasites of diseased poultry sent from various parts of Scotland for post-mortem examination are reported.

Changes in the serums of fowls resulting from Plasmodium gallinaceum infection [trans. title], V. Chorine (*Compt. Rend. Soc. Biol. [Paris], 127 (1938), No. 13, pp. 1189–1191*).—Changes observed in the serums of *P. gallinaceum*-infected fowls are considered.

Leucemia (erythroleucosis) of canaries, A. J. Durant and H. C. McDougle. (Mo. Expt. Sta.). (*Vet. Med., 33 (1938), No. 9, pp. 388, 389, 420, figs. 3*).—Examinations of diseased canaries made in the course of an investigation of leukemia of the canary, recently undertaken, are briefly reported upon.

Sources of internal parasites of fur bearers, W. A. Riley (*Amer. Fur Breeder, 9 (1936), No. 5, pp. 4, 6*).—A practical discussion of the subject as relates to prevention of infestation of the fur-bearing animals by internal parasites.

AGRICULTURAL ENGINEERING

Irrigation in the United States, W. A. Hutchins, M. R. Lewis, and P. A. Ewing (*U. S. Dept. Agr. Yearbook 1938, pp. 693–703, figs. 2*).—The authors briefly trace the development of irrigation and discuss the present situation in some detail.

Soil, water supply, and soil solution in irrigation agriculture, C. S. Scofield (*U. S. Dept. Agr. Yearbook 1938, pp 704–716*).—The author calls attention to the peculiarities of arid soils and the need of further treatment than merely supplying them with water. He discusses the character of the soil solution in arid soils and the influence of the quality of the irrigation water and points out important unsolved problems.

Drainage in arid regions, J. Thorp and C. S. Scofield (*U. S. Dept. Agr. Yearbook 1938, pp. 717–722, figs. 3*).—This paper points out that it is as important to drain arid soils without allowing salinification of the root zone as it is to irrigate them. Tile drains, deep knifing, open ditches, and drainage wells are discussed in relation to the character of the soil and the topography.

Drainage in the humid regions, J. R. Haswell (*U. S. Dept. Agr. Yearbook 1938, pp. 723–736, figs. 7*).—The author discusses types of humid soil needing artificial drainage, the question whether or not it is profitable to drain organic soils, open as against tile drainage, uniform v. intercepted tile drainage systems, factors determining depth and spacing in tile drains, location of intercepting drains, and similar matters.

Studies on the removal of fluorine from drinking waters in the State of Iowa, C. A. Kempf, W. E. Galligan, D. A. Greenwood, and V. E. Nelson. (Iowa State Col.). (*Iowa Acad. Sci. Proc., 43 (1936), pp. 191–195*).—In continuation of previous studies (E. S. R., 69, p. 620), the authors give a preliminary report on a large-scale method for the removal of fluorine from water which consists of a 25-hr. treatment with aluminum sulfate, with the pH of the water below 7. The method was tested on Ankeny city water and the fluoride concentration was lowered from 7 to 10 p. p. m. to from 1.5 to 2 p. p. m. of water.

Public Roads, [September 1938] (*U. S. Dept. Agr., Public Roads, 19 (1938), No. 7, pp. [2]+125—152+[1], figs. 28*).—This number of this periodical contains data on the current status of various highway projects as of August 31, 1938, and an article entitled Highway Tunnels in Western States (pp. 125–150).

Tillage machinery, R. B. Gray (*U. S. Dept. Agr. Yearbook 1938, pp. 329–346, figs. 12*).—This is a nontechnical discussion of plows and plowing; cultivators and related implements and their adaptations to specific uses; and tillage machinery, including planters, used especially in the preparation for and subsequent treatment of corn and cotton crops.

AGRICULTURAL ECONOMICS

The Nation and the soil (*U. S. Dept. Agr. Yearbook 1938, pp. 45–318, figs. 31*).—These pages of the Yearbook deal with the problems and causes of soil misuse from the economic and social standpoint and some of the possible remedies. What the public purposes in soil use are or should be are described in an article by C. C. Taylor, B. W. Allin, and O. E. Baker (pp. 47–59). The problems of present extent and nature of soil misuse are indicated in articles on Land Unfit for Farming in the Humid Areas, by C. P. Barnes (pp. 60–67); Subhumid Areas, by J. B. Bennett, F. R. Kenny, and W. R. Chapline (pp. 68–76); and Drained Areas and Wildlife Habitats, by F. R. Kenney and W. L. McAtee (pp. 77–83); and The Nation as a Whole, by E. J. Utz et al, (see p. 160). The possible social and economic causes of the misuse are discussed in four articles—Traditional Attitudes and Institutions, by L. C. Gray, J. B. Bennett, E. Kraemer, and W. N. Sparhawk (pp. 111–136); Defects in Farming Systems and Farm Tenancy, by M. R. Cooper, W. J. Roth, J. G. Maddox, R. Schickele, and H. A. Turner (pp. 137–157); Imperfections in Agricultural Finance, by D. L. Wickens, R. C. Hall, and D. Jackson (pp. 158–170); and Price Relations and Economic Instability, by L. H. Bean, J. P. Cavin, and G. C. Means (pp. 171–197). Remedies are discussed in articles on Education and Research, by C. W. Warburton, C. B. Manifold, C. E. Kellogg, and C. P. Barnes (pp. 198–222); Policies for Public Lands, by E. H. Clapp, E. N. Munns, I. H. Sims, G. S. Wehrwein, and C. F. Clayton (pp. 223–240); Policies for Private Lands, by G. S. Wehrwein, C. I. Hendrickson, M. H. Saunderson, P. M. Glick, C. C. Taylor, F. R. Kenney, and M. Harris (pp. 241–264); Changes in Agricultural Finance, by D. Jackson, R. C. Hall, R. M. Green, and D. L. Wickens (pp. 265–278); Direct Aids to

Farmers, by O. V. Wells, J. P. Cavin, and D. S. Myer (pp. 279–288); and Economic Stabilization, by O. V. Wells and B. W. Allin (pp. 289–295). An article on The Soil and the Law, by P. M. Glick (pp. 296–318), indicates "some of the problems that must be solved if remedial measures for the better handling of our soil resources are to be translated from paper programs to living institutions, that is to say, are to be enacted into law, administered, and made effective."

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 194 (1938), pp. 176–178*).—Included is an article by R. W. Sherman on Effect of Base and Surplus Plans on Volume of Milk Sales by Individual Producers (pp. 176, 177), with a table showing by years, 1927–36, for a sample of 374 milk producers in 4 Ohio markets the number changing from summer to winter and from winter to summer classifications and whether their volume of shipments were higher or lower. The table of index numbers of production, prices, and income, by J. I. Falconer (E. S. R., 80, p. 119) is brought down through June and July 1938.

Proceedings of the ninth annual meeting of the Canadian Agricultural Economics Society, Saskatoon, Sask., 1937 (*[Ottawa], 1937, pp. [7]+125, [pl. 1, figs. 7]*).—Included are the following papers presented at the meeting held at the University of Saskatchewan, June 28–30, 1937: The Place of Research in Agricultural Policy, by O. B. Jesness (pp. 1–9); A Program of Research in Land Economics, by W. Allen (pp. 10–22); The Resettlement Administration Program in the Lake States, by E. G. Grest (pp. 23–31); The Development of Technique in Land Utilization Studies, by C. C. Spence (pp. 32–38); Application of Research in Land Utilization, by J. Proskie (pp. 39–46); Economic Aspects of Crop (Yield) Insurance With Reference to the Province of Saskatchewan, by W. J. Hansen (pp. 47–58); Canada as a Country of Immigration, by C. A. Dawson (pp. 59–67); The Immigration Problem in the Prairie Provinces, by W. W. Swanson (pp. 68–74); Studies of Consumption of Agricultural Products, by W. C. Hopper (pp. 75–84); The Utilization of Consumption Research by Agricultural Cooperatives, by V. C. Fowke (pp. 85–92); The Elasticity of Demand for Farm Products, by J. E. Lattimer (pp. 97–104); and The Importance of Demand in Determining Prices of Agricultural Products, by H. G. L. Strange (pp. 109–114).

Economic and social factors associated with land class in Jefferson County, Tennessee.—A preliminary report, C. E. Allred, H. J. Bonser, W. E. Hendrix, and E. E. Briner (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 76 (1938), pp. [1]+III+74, figs. 11*).—This is a preliminary report of the relation of land class to occupational and tenure status of families, farm organization, tax assessments and delinquencies, farm real estate transfers, farm mortgage indebtedness, property insurance, rural relief, etc. The lands are divided into five classes on the basis of productive capacity as conditioned by soil type, slope, and degree of erosion.

Type of farming and ranching areas in Wyoming, B. Hunter, H. W. Pearson, and A. F. Vass. (Coop. U. S. D. A.). (*Wyoming Sta. Bul. 228 (1938), pp. 180, figs. 39*).—The historical background of farming and ranching in the State and the physical, biological, and economic factors affecting agriculture are described. The major agricultural problems of the State are discussed. Maps are included showing by counties the distribution of crop and livestock enterprises and farms of different types. The State is divided into 17 type-of-farming areas, and the climate, soils, vegetation, crops, livestock enterprises, types of farming, etc., of each are described and discussed.

Semi-annual index of farm real estate values in Ohio, July 1 to December 31, 1937, H. R. Moore (*Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 107 (1938), pp. 6*).—This bulletin continues the series (E. S. R., 78, p. 871).

Acquisition of farm land by credit corporations in Tennessee, C. E. Allred and D. K. Law. (Coop. U. S. D. A. et al.). (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 77 (1938), pp. [1]+III+49, figs. 15*).—Part 1 discusses the national aspects of acquisition of farm lands by credit corporations as related to Tennessee. Part 2 analyzes the situation in seven counties of Tennessee, one selected in each region of the State, the counties being representative of different types of farming. For these counties data as to acquisitions, sales, and holdings, 1922–36, by counties and by types of credit corporations are discussed.

On January 1, 1937, 1.41 percent of the farm lands in the 7 counties was held by credit corporations as compared with 2.63 percent in the East South Central States. The number of farms so held in the 7 counties increased from 8 in 1922 to 160 in 1930 and 370 in 1935, then decreased to 297 on January 1, 1936. The peak of acquisitions was reached in 1932 in Tennessee and in 1934 in the United States. Sales in the 7 counties exceeded acquisitions for the first time in 1935. Insurance companies and commercial banks have consistently held over one-half of the total corporate land, and the Federal Land Banks and trust companies one-third of the land. Insurance company holdings were concentrated in high land value areas. Commercial banks had a wide distribution of holdings in both productive and less productive areas. With the continuation of the 1935 rate of sales, about 8 yr. would be required for the disposal of the present holdings of credit corporations if no more lands were acquired.

Power machinery effects on management and on costs of potato farming in New Jersey, J. W. Carncross, A. G. Waller, and E. Rauchenstein. (Coop. U. S. D. A.). (*New Jersey Stas. Bul. 649 (1938), pp. 59, figs. 21*).—This study is based on (1) surveys of the costs of producing potatoes, made each year, 1926–36, on from 30 to 57 farms, which showed, among other things, the potato acreages, quantities of seed and fertilizer used, hours of man labor and of horse and tractor use, income, and expenses; (2) records obtained for 1931, with the assistance of a field man, of the receipts and expenses, quantities of materials, and hours of man labor and of horse and tractor work by crops and operations on 53 farms in central and 7 farms in southern New Jersey; and (3) data as to costs of operating tractors, trucks, planters, diggers, and cultivators, and on farm organization for 1931 and 1934, with some additional data for 1936. The data are analyzed and discussed.

The average size of farms studied in 1931 was 145 acres, with 108 acres in crops, of which 50 acres were in potatoes. The farms with above-average labor incomes had larger average acreages of potatoes and yields above the average. The average cost of keeping a horse in 1931 was $138.24, and the average use 562 hr. per year. In 1936 the cost of operating a tractor was 38 ct. per hour for the tractors used an average of 1,273 hr. and 59 ct. for those averaging only 420 hr. use. From 1931 to 1936 on 39 farms in the central area, the average total acreage increased from 139 to 178; the average acreage in potatoes increased from 60 to 80; the acreage of wheat increased; the acreages of corn, hay, and rye decreased; and the average number of horses per farm decreased from 3.5 to 1.6. In 1912, 37 hr. of man labor and 55 hr. of horse work were required to produce an acre of potatoes up to harvest, while in 1936 on 10 specialized potato farms using general-purpose tractors only 17.2 hr. of man labor, 6.8 hr. of tractor use, and 4.1 miles of truck use were required. The

10 farms averaged 88 acres of potatoes, and the approximate original investment in machinery and equipment was $4,500. For the 5-yr. period 1932–36, yields and average cost per bushel for potatoes on the central New Jersey farms were on the one-third farms with the highest yields 266 bu. and 41 ct., and on the one-third farms with the lowest yields 176 bu. and 56 ct. Four-yr. records indicated that spraying gave a good return on the investment as compared with dusting. A fairly close relationship between rainfall in July and yields of potatoes was found in the central part of the State.

Tobacco (*[Gt. Brit.] Imp. Econ. Com. Rpt., 31 (1937), pp. VI+83*).—This is the thirty-first report of the Imperial Economic Committee. The world production and trade in tobacco; the development in British Empire countries producing in excess of local requirement and exporting regularly to the United Kingdom, those importing comparatively little leaf and at times exporting to the United Kingdom, and those largely dependent on importations of leaf; the production, exports from, consumption in, etc., the United States, 1929–36; imports of countries other than the United Kingdom; and the statistical position, prospects, consumption of Empire leaf in pipe tobacco and cigarettes in the United Kingdom, and the exports from the United Kingdom of manufactured tobacco are discussed. Appendixes include estimates of the quantities and value of Empire and foreign leaf in pipe and cigarette tobacco consumed in the United Kingdom and tables showing the world and Empire areas under tobacco, the gross and retained imports into, re-exports from, and the clearance from bond of unmanufactured tobacco, and the exports of manufactured tobacco and cigarettes (quantity only) from the United Kingdom, and the production, exports, and average price of unmanufactured tobacco for the United States.

Tobacco production and consumption in China, J. B. Gibbs (*U. S. Dept. Agr., Bur. Agr. Econ., F. S. 77 (1938), pp. [3]+48, figs. 10*).—The production, marketing, imports and exports, and consumption of tobacco in China are described and discussed. Production is estimated at about 1,300 million pounds, of which 47 percent is sun-cured, 40 percent cigar, and 13 percent flue-cured types. The consumption in recent years has been about 1,200 million pounds, of which 80 percent is used in pipes, 15 percent in cigarettes, 4 percent in cigars, and 1 percent in snuff. Annual per capita consumption is estimated at about 2.8 lb. as compared with 6.6 lb. in the United States. For several years prior to 1931, cigarette factories in China imported about 100 million pounds of American leaf, but during the past few years there has been a rapid substitution of a Chinese-produced leaf. Imports of leaf tobacco declined from 150 million pounds for the period 1928–31 to 40 million pounds for the 3 yr. 1935–37. Exports of leaf tobacco have equaled approximately the imports.

Fruit trees in Yakima County, Washington, C. P. Heisig and B. H. Pubols. (Coop. U. S. D. A. et al.). (*Washington Sta. Bul. 359 (1938), pp. 58, figs. 25*).—This bulletin presents an analysis of the apple, pear, peach, cherry, plum and prune, and apricot trees in the Yakima Valley in 1936. Tables, maps, and charts show for each fruit the distribution of bearing and nonbearing trees by census periods 1910–35, the distribution in 1936 by districts of varieties by age groups, and for apples the number of trees pulled, 1935 and 1936.

The valley in 1936 had over 3,837,000 fruit trees, of which apple trees comprised 40.5, pear 35.1, peach 12.3, cherry 4.2, plum and prune 4.1, and apricot 3.8 percent. During recent years approximately 3 times as many apple trees have been pulled as were planted. Winesaps constituted about 42 percent of all apple trees but only about 29 percent of those less than 10 yr. old. Delicious trees comprised 29 percent of all apple trees and 60 percent of those less than 10 yr. old. Pear trees under 10 yr. old were more than 1½ times as numerous as apple trees of the same age. Apple tree removals in 1935 and 1936 were about 5 times those of pear tree removals. Bartlett pears accounted for about 75 percent of all trees. D'Anjou trees comprised less than 8 percent of all trees but nearly 20 percent of those less than 6 yr. old. Planting of peach trees 1931–35 was sufficient to maintain the number of trees in the valley. Elberta trees comprised 56 percent of all peach trees but only 24 percent of those under 6 yr. old, while Hale trees comprised 31 percent of all trees and 46 percent of those less than 6 yr. old. Plantings of cherry trees 1931–35 were sufficient to provide a slight increase in bearing trees in case the plantings are evenly distributed as to age and trees have a life of 40 yr. Bing cherry trees constituted 64 percent of all trees and 76 percent of those less than 6 yr. old. The number of plum and prune trees of nonbearing age in 1935 was so small that there will probably be a decrease in the number of bearing trees by 1940. As most of the apricot trees are in full bearing, a relatively stable level of production may be expected for a few years, but production will eventually decline unless plantings are greatly increased over those from 1931 to 1935.

Apples and pears: A survey of production and trade in British Empire and foreign countries (*London: Imp. Econ. Com., 1938, pp. 276, [fig. 1]*).—Included is a general review of international trade in apples and pears and a discussion by countries grouped as exporting, exporting and importing, and importing, number of trees, production, disposal of crop, exports and imports, and consumption of fresh, canned, and dried apples and pears. Appendixes include tables showing the production, exports, and imports by countries by 5-yr. periods, 1919–37, and by years, 1929–37.

The orange industry: An economic study, J. M. Thompson (*California Sta. Bul. 622 (1938), pp. 85, figs. 22*).—This bulletin, which supersedes the bulletin previously noted (E. S. R., 60, p. 186), analyzes the acreage, production, and shipments of oranges in the United States; the demand and prices for, income from, purchasing power, etc., of California oranges; the foreign trade of the United States in oranges; and the foreign production and exports of oranges.

Approximately 62 percent of the United States production of oranges originates in California and 35 percent in Florida. Year-to-year fluctuations in production vary considerably, but during the last 15 yr. the average increase has been about 6 percent per year in California and 8 percent in Florida. The proportion of total United States shipments during May through October has increased to 40 percent. The per capita consumption of oranges in the United States increased from 19 to 26 lb. during the decade following 1923–25, while that of 14 important fresh fruits, including oranges, decreased from 163 to 149 lb., the main part of the decrease being in apples. The prices of California oranges rose from 1921 through 1930, declined precipitously in 1931, and remained low for three seasons then recovered somewhat. The purchasing power of California winter oranges was above the average for the years 1909–14 in a majority of years since the World War, but that of summer oranges was above in only 6 yr., 5 of which were years of particularly low shipments. United States exports of oranges usually run from 7 to 10 percent of the total shipments. They have fluctuated widely from year to year but increased steadily during any decade.

The outlook is for substantial increases in orange production in California, the United States, and the world during the next decade.

Florida citrus costs and returns, R. H. Howard. (Coop. U. S. D. A.). (*Fla. Univ. Agr. Ext. Misc. Pub. 26 (1938), pp. 31, figs. 2*).—The general outlook for citrus fruits is discussed. Tables are included and discussed showing the costs per acre and returns per acre and box for from 41 to 272 groves of various ages and for various periods from 1930–31 to 1936–37. Data as to the average amounts and costs of different plant food elements used, the effects of irrigation on orange and grapefruit groves, and the prices per box received for the major varieties of citrus fruits are also tabulated.

Economic studies of dairy farming in New York.—XIV, Factors affecting premiums received in grade-A-milk production, E. G. Misner (*[New York] Cornell Sta. Bul. 698 (1938), pp. 28, fig. 1*).—The companies purchasing Grade A milk from 100 farms in the Tully-Homer area, Cortland County, furnished the bacterial-count premium for each farm in each (3) period of each month for the year ended February 28, 1937. The bacteria per cubic centimeter of milk permissible were first rating, 10,000 or less; second rating, from 10,001 to 25,000; and third rating, over 25,000. Tables and text show the number of farms receiving each rating, the farms being grouped on various bases.

Large businesses as measured by productive-man-work units, number of cows, or total pounds of milk sold per year received first premium ratings a smaller proportion of the time than did small businesses. Farms with a high rate of labor efficiency per man received first ratings a smaller proportion of the time than farms with a lower rate of labor efficiency. Test of milk, use of milking machines, and production per cow were related to bacterial count, but the relationship appeared to be due to the association of these factors with size of business. Age and schooling of operators, cash-crop production, crop yields, distance to station, and whether milk was handled by the farmer or by haulers had little if any effect on the ratings received.

An economic analysis of creamery operations in Manitoba, Saskatchewan, and Alberta, C. V. Parker (*Canada Dept. Agr. Pub. 605 (1938), pp. 36, figs. 4*).—A survey of creameries operating in the three Prairie Provinces of Canada showed that approximately 45 percent of the total butter produced was manufactured during June, July, and August. The average cost of manufacturing butter was 3.45 ct. per pound, ranging from 4.82 ct. in plants producing less than 100,000 lb. per year to 3.18 ct. in plants producing over 500,000 lb. annually. Most of these differences occurred between plants producing under 100,000 lb. and those producing from 100,000 to 199,000. The average delivery of butterfat per patron was only 440 lb. per year and this, coupled with the low density of farm population, resulted in relatively high costs for gathering cream.

Seasonal labor requirements for California crops, R. L. Adams (*California Sta. Bul. 623 (1938), pp. 28, figs. 3*).—This bulletin summarizes the county findings previously noted (E. S. R., 79, p. 265) and discusses the problem for the State as a whole. Tables and charts show for 1935–36 the acreage and production of field, fruit and nut, and truck crops in the State; the range and usual output per man-day for specific crops and tasks; by counties and for the State as a whole the monthly requirements for seasonal workers in man-days and the number of seasonal workers required; and the monthly requirements in percentages of total annual requirements for specified tasks and crops. Some of the problems of the farmers and laborers due to the wide variations in monthly requirements are discussed.

The total requirements indicated for seasonal labor in 1935–36 were 22,467,800 man-days. The monthly requirements varied greatly, being from 948,345 to 1,451,819 man-days from November through April, from 2,071,250 to 2,300,837 man-days from May through July, and from 2,762,691 to 3,100,383 man-days from August through October. The number of workers required varied from 48,173 in March to 144,720 in September. The seasonal man-day (9-hr. day) requirements per 1,000 acres of different crops were found to be carrots 22,117, cotton 7,302, hops 37,100, lettuce 8,389, pears 7,896, peas 9,404, prunes 4,130, sugar beets 5,605, tomatoes 9,724, and walnuts 1,067. The requirements for lemons and oranges were 71 man-days per 1,000 boxes and for onions 105 man-days per ton.

A survey of the demand for agricultural labor in Oregon, H. H. White (*Portland: Oreg. State Planning Bd., 1937, pp. 213, figs. 9*).—This third volume of the study of employment and migration in Oregon shows "statistically, graphically, and narratively, seasonal requirements for agricultural labor in the State by counties and districts for 28 major field crop and horticultural enterprises and for 8 major livestock enterprises." Schedules are included showing the per acre labor requirements by months for hops, small grains, dry land wheat, and pear enterprises for different operations, and the total monthly requirements for one dairy animal and one sheep. Tables based on the 1934 acreages and numbers of livestock show the estimated agricultural labor requirements for each county for each of the 28 field and horticultural crops and the 8 livestock and poultry enterprises, and for the State and each agricultural district and county the estimated number of man-hours to perform major operations.

Market research sources: A guide to information on domestic marketing, R. Bretherton (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Dom. Com. Ser. 55 (1938), pp. IV+273*).—Materials published in the years 1933–36 and part of 1937 by the different Federal Departments and agencies; State governments; colleges, universities, and foundations; publishers of books and trade directories; and commercial organizations are listed.

The transportation of New Hampshire milk.—I, Analysis of trucking charges, A. MacLeod and M. L. Geraghty (*New Hampshire Sta. Bul. 307 (1938), pp. 32, figs. 8*).—The transportation of milk to Lancaster, a town in the Connecticut River Valley in the northern part of the State surrounded by a typical Boston supply area, and to Nashua, a city in the southern part of the State consuming practically all milk hauled to it, are described. Using data from 86 independent and 2 distributor routes in the Connecticut Valley and 45 independent and 19 distributor routes in the Merrimack-Coastal area of the State, comparisons are made of the characteristics of routes classified according to region and type of operator. Trucking charges under conditions of perfect competition are discussed. The data from the 152 routes and the Lancaster and Nashua areas are analyzed to determine in how far average charges in similar routes approach equality, the extent to which charges paid by producers vary with distance from market and amount of milk collected, the relationship of rates to road conditions, services rendered, etc., and the differences of rates charged by independent and distributor truckers in the Connecticut Valley and Merrimack-Coastal regions.

For the 152 commercial truck routes in June 1937, the average daily volume of milk hauled was 2,804 lb., the average distance traveled 38.5 miles, the average volume of milk collected per farm 215 lb., and the average trucking charge 23.68 ct. per 100 lb. The average charges per 100 lb. were for independent truckers 20.46 ct. in the Connecticut Valley and 28.01 ct. in the Merrimack-Coastal area. The average charges of distributor truckers were 26.31 and 29.54 ct., respectively. Charges did not vary consistently with variations in distance traveled, volume carried, or other factors generally influencing cost of truck operations. Differences of 10 ct. or more per 100 lb. were the rule rather than the exception on routes similar in length and volume of milk handled. Charges on routes of the same length with the same amount of milk collected from about the same number of farms varied from 15 to 30 ct. per

100 lb. It is estimated that a reduction in rates of 5 ct. per 100 lb. on one-fifth of the routes would result in a saving of about $12,000 per year to New Hampshire milk producers.

Some facts concerning means of transportation and methods used in marketing New York State fruits and vegetables, M. P. Rasmussen (*[New York] Cornell Sta. Bul. 697 (1938), pp. 113, figs. 5*).—This study was made to obtain the facts available concerning the use of the motor truck and practices of growers and others incidental to the marketing of fruits and vegetables in areas economically tributary to New York City. Data regarding the marketing operations for the year ended June 30, 1934, were obtained from 939 New York fruit and vegetable growers in 12 intensive producing areas. Facts as to the methods of transportation used were obtained from 43 private country shippers and 23 farmers' cooperative associations in the State, and records of 16 leading commission firms in New York City were available for analysis. Data were also available as to the costs of operating the trucks of 277 commercial operators and 2,048 farm trucks in New York and 8 nearby States. Among the subjects analyzed and discussed are where New York growers dispose of produce; effect of place of sale on net returns; sales agencies or outlets utilized and their effect on net returns; means of transportation used by growers; marketing in bulk v. in containers; number, size, and cost of operation of trucks used by growers; distances produce was hauled; operations by country dealers, farmers' cooperative associations, and commercial and merchant truckers; and the problems resulting from the use of motor trucks.

The proportion of fruit and vegetable supplies arriving in New York City by motor truck increased from 13 percent in 1929 to 34 percent in 1936, the increase from nearby States being from 42 to 86 percent. The 939 New York growers sold about 17 percent of their produce at the farm, 54 percent at country shipping points or local markets, and 29 percent at large city markets, utilizing 17 different outlets, sales agencies, or types of buyers. About 91 percent of their produce moved to primary place of sale by trucks, 7.5 percent by rail, and 1 percent by wagon. Of the produce hauled in grower-owned trucks, 81 percent was moved less than 10 miles and only 3 percent over 100 miles. Of that moved by commercial trucks, 41 percent was hauled less than 50 miles and only 10 percent over 150 miles. Of produce shipped by the 43 New York country dealers, 50 percent was hauled by truck; 30 percent of that marketed by the farmers' cooperative associations was hauled by truck. The 939 growers had 437 trucks, more than half of which had rated capacities of 1.5 tons and almost one-third were of 1-ton capacity. No one type of buyer consistently paid highest net returns to growers or operated at the lowest marketing costs. Usually marketing costs were highest in city markets, next highest at country shipping points or local markets, and lowest at the farm. The author concludes that (1) the most acute problem incident to the use of motor trucks in marketing fruits and vegetables arise from inadequate knowledge of market supplies, inadequate terminal facilities for handling produce arriving by truck, variations in State motor-vehicle laws, lack of salesmanship, and lack of control of movement to market; (2) since total market supplies of fruits and vegetables have actually decreased in recent years, the lower prices cannot be accounted for by increased supplies arriving by truck; and (3) method of transportation does not seem to have any measurable effect on grades or prices of fruits and vegetables.

An economic study of the marketing of western New York potatoes by motor truck, P. J. Findlen (*[New York] Cornell Sta. Bul. 700 (1938), pp. 52, fig. 1*).—Data for the 1932–33 season were gathered from 569 farms in 28 towns of 5 counties in western New York for the purpose of determining the extent to which potatoes are marketed by truck, the costs of marketing and net returns to growers according to different methods of marketing, and the advantages and efficiency of marketing by truck. The farms included produced nearly 1,168,000 bu. of potatoes. An analysis is made to show the relation of acreage to percentage of crop stored, types of storage, sales from storage, use and disposal of crop, kinds and grades of potatoes sold, types of buyers and truckers, percentages of crops handled by each type, marketing costs and net returns with the different types of buyers and truckers, places of delivery, methods of transportation and their effect on marketing costs and net returns, seasonal variations in sales, types and size of containers used, etc. An analysis is also made of the different methods of transportation used for products other than potatoes and farm supplies purchased.

Although the potato acreage in the five counties has not decreased, the carlot shipments decreased about 50 percent from 1920–24 to 1930–33. During the 1932–33 marketing season rail shipments were generally handled by local carlot dealers, cooperatives, and farmers shipping to city wholesalers, but only about 50 percent of the business of such buyers could have been handled by rail. Truckers have become the second most important type of buyer. Practically all sales to truckers and about 60 percent of those to local carlot dealers are made at the farm, and more than 90 percent of the 1932 crop was moved from the farm by trucks. Trucks were valuable means of handling other products but less important in handling farm supplies. The purchase of a truck for hauling potatoes alone would probably not be economical on most of the farms in the area.

Maintenance of substantial equity in the pooling of lemons, H. R. Wellman and M. D. Street (*California Sta. Bul. 619 (1938), pp. 123*).—This study, of which a preliminary report has been noted (E. S. R., 76, p. 557), was made at the request of the Santa Paula Citrus Fruit Association to determine what changes, if any, should be made in its pooling system. Much of the detailed analysis is based on the records of the association for a period of 10 yr. Detailed records on various aspects were also obtained from 9 other lemon and citrus associations in California and specific data from some 20 other associations visited, and numerous persons actively engaged in the lemon industry were consulted. The data are analyzed and discussed in sections on the typical method of handling lemons, grade pools, size pools, time pools, color pools; and byproduct pools, including the adjustments between the other types of pools. Appendixes include explanations and illustrations of the computation of pool returns. The allocation of expenses of associations to different classes of fruit is not covered.

United States agricultural trade with Canada, January–June 1938 (*U. S. Dept. Agr., Bur. Agr. Econ., F. S. 76 (1938), pp. [2]+12*).—Tables are included showing for the first 3 mo. and the first 6 mo. of the years 1935–38, inclusive, the value of all commodities and of nonagricultural, agricultural, agricultural on which duties were reduced under agreement, and other agricultural commodities exported to and imported from Canada. Other tables show for different agricultural commodities the quantity and value of exports to and imports from Canada, January–June 1937 and 1938.

The value of agricultural exports from the United States to Canada during the first half of 1938 nearly doubled over that for the first half of 1937. The value of imports from Canada was but little more than 15 percent of that for the same months in 1937. The chief developments in exports were a larger volume of fruits and vegetables with somewhat lower value, a heavy increase in grains, notably corn, going to and through Canada, and a small increase in meat and livestock. There was a sharp decline both as to number and value of cattle imported into the United States and smaller imports of cheese, cream, seed potatoes, and practically all other agricultural items.

The tariff on long-staple cotton and its effects, C. F. WELLS and M. R. COOPER (*U. S. Dept. Agr., Bur. Agr. Econ., 1938, pp. 58, figs. 4*).—This report deals principally with the effect on prices received by producers of long-staple cotton in the United States of the Tariff Act of 1930, which placed a duty of 7 ct. per pound on cotton having a staple 1⅛ in. or more in length and left shorter cotton on the free list. The first part deals with Egyptian Uppers and American long-staple upland cotton, and the second part with Egyptian extra long-staple and American-Egyptian or Pima cotton.

The authors state that two entirely different methods of analysis "agree in indicating that the duty raised the domestic price of American long-staple upland less than one-fourth of the 7-ct. duty above what it would have been without the duty. The analysis of premiums shows that the beneficial effect of the duty on the domestic price of American 1⅛-in. cotton was undoubtedly less than 1.8 ct. per pound on the average in the 7 postduty years. This analysis also suggests that the duty may have raised the average price of this cotton only 0.2 ct. or less during this period, and that it hardly seems likely to have raised the average price by as much as 0.5 ct. The other analysis indicates that the duty probably benefited the price of the domestic cotton less than 0.5 ct. per pound. . . .

"The duty caused the spread between the price of Egyptian Uppers in New England and in Alexandria to be approximately 7 ct. per pound greater than it would have been in the absence of the duty. The analysis indicates that most of the effect of the duty on this spread took the form of an increase in the New England price. In fact, the indications are that the duty caused the New England price of a given quality of Uppers to average more than 6.75 ct. higher and the Alexandria price less than 0.25 ct. lower than would have been the case in the absence of the duty."

The data pertaining to extra long-staple cotton (Pima and Sakellaridis) were more limited than those for American long-staple upland and Egyptian Uppers, . . . but indicate that "the duty resulted in at least a slightly higher price of Pima than otherwise would have existed. In addition, a comparison of the competitive positions of Pima and of long-staple upland suggests that the duty probably benefited by the price of Pima at least as much as, and possibly more than, the price of American long-staple upland cotton. The duty appears to have caused the spread between the United States and foreign price of a given quality of Egyptian Sakellaridis cotton to average about 7 ct. per pound greater with the duty than it would have without the duty. In the case of Sakellaridis it appears that the duty caused a smaller increase in the United States price and a larger decrease in the foreign price than was true of Egyptian Uppers."

Report of the Wheat Commission upon the administration of the Wheat Act, 1932, from June 1, 1932, to July 31, 1937, E. PEEL ET AL. ([*Gt. Brit.*] *Min. Agr. and Fisheries, Econ. Ser. 45* (*1938*), *pp. XI+253*).—This report deals with the principal provisions of the act and of the bylaws made by the commission, the methods, problems, and results of administration, the standard price for wheat during the period covered, and proposals for amending the act.

Price areas of farm products in Tennessee, C. E. ALLRED and P. T. SANT (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 75* (*1938*), *pp.* [*1*]+*V*+*31, figs. 10*).—An analysis is made of the average and relative prices of important farm commodities in the six crop-reporting districts of the State.

Stumpage prices of privately owned timber in the United States, H. B. Steer (*U. S. Dept. Agr., Tech. Bul. 626 (1938), pp. 163, figs. 78*).—"The purpose of this investigation was threefold: (1) To compile and classify all available records of prices paid for privately owned standing timber, (2) to develop price trends for the more important commercial species in the largest timber-producing regions, and (3) to compare the price trends developed with those of other basic products of the soil and with the record of general commodity prices." The stumpage-price and other data were obtained from records of the Forest Service, the Bureau of the Census, and the Bureau of Internal Revenue, and other published and unpublished data were obtained in Federal and private investigations. The stumpage price data for the period 1900–1934 covers over 50,000 transactions involving nearly 500 billion feet of lumber sold for nearly 1½ billion dollars.

The long-time trend of stumpage prices for the country as a whole since 1900, when adjusted for the purchasing power of the dollar, has been distinctly upward. Hardwood stumpage prices have shown greater appreciation than those for softwood. Stumpage prices have been more stable than log and lumber prices but have followed nearly parallel trends. Higher prices are paid not only for the more accessible stumpage but also for that of high quality. On the average, flat-rate sales were made at lower prices than individual sales of comparable material. Stumpage prices since 1900 have followed the same general trends as prices of farm products, other commodities, and basic raw materials, but have not gone so high in periods of inflation or so low in periods of deflation and depression.

Crops and Markets, [September 1938] (*U. S. Dept. Agr., Crops and Markets, 15 (1938), No. 9, pp. 185–208, figs. 2*).—Included are crop and market reports of the usual types.

Agricultural statistics, 1938 (*U. S. Dept. Agr., 1938, pp. [1]+544*).—This volume, prepared under the direction of J. L. Orr et al. (the Yearbook statistical committee), continues the series previously noted (E. S. R., 77, p. 876). Included are statistics of grain, cotton, sugar, tobacco, fruits and vegetables, miscellaneous crops, beef cattle, hogs, sheep, horses, mules, dairy cattle, dairy products, poultry, poultry products, foreign trade in agricultural products, farm business and related subjects, and miscellaneous subjects, such as forestry, weather, roads, etc.

[Agricultural statistics, Kansas, 1935–36] (*Kans. State Bd. Agr. Bien. Rpt., 30 (1935–36), pp. 259–590*).—Included are tables showing for 1935 and 1936 by townships, cities, and counties the population, assessed valuation of land and personal property, numbers and value of different kinds of livestock, and acreages, yields, and value of different crops; State acreages, production, and value of different crops, different kinds of livestock, and livestock products for periods of years; Federal Government rental and benefit payments by counties for different commodities; numbers of tractors, combines, and threshing machines by counties 1935 and 1936; and acreages of tame and prairie grass pastures by counties 1936.

World fresh fruit production statistics, A. C. Edwards and S. I. Katz (*U. S. Dept. Agr., Bur. Agr. Econ., F. S. 75 (1938), pp. [2]+41, figs. 12*).—Tables and charts show by leading countries the production—averages 1921–25 and 1926–30 and by years 1931–37—of apples, apricots, bananas, berries, cherries, currants, grapefruit, lemons, limes, oranges, peaches, pears, plums, quince, table grapes, and wine. In most cases other tables show the estimated number of trees or acreages, 1929–35, by countries.

RURAL SOCIOLOGY

Part-time farming in six industrial areas in Pennsylvania, M. E. John (*Pennsylvania Sta. Bul. 361 (1938), pp. [2]+49, figs. 15*).—Data were obtained by interviews regarding 887 part-time farms. The characteristics of the part-time farm population—nationality, age distribution, size of family, schooling of operator, nonagricultural employment, mobility, tenure, etc., the characteristics of the farm—land use, investment in livestock, machinery, lands, etc., and their relation to family labor earnings from the farms are analyzed and discussed. The attitude toward part-time farming, the facilities for home and family living, and the social participation of the families are also discussed.

The farms averaged 20.8 acres of which 46 percent was in crops. Of the operators, 85 percent were reared in the country, 83 percent had a flock of chickens, over 50 percent a cow, and 25 percent produced their own pork. The total investment per farm was $3,126 for owners and $191 for renters. An average of 186 8-hr. days of labor was used per farm of which 44 percent was performed by the male head, 26 percent each by the housewife and children, and 4 percent by other adult members of the household. The average family income (commuting costs not deducted) was $1,029, of which $189 was from the farm, $773 from nonagricultural employment, and $67 from miscellaneous sources. The total farm expenses averaged $432. The average farm receipts were $621, which included $222 for produce sold, $242 for produce consumed, $11 increase in livestock inventory, and $146 for use of dwelling. Size of family, age, education and nativity of operators, and income from nonagricultural occupations were significantly associated with labor earnings from the farm. Size of farm, amount of labor used, and capital invested were each independently related to earnings. Of the 887 farmers, 63 percent offered no adverse criticism of part-time farming. Church organizations, lodges, and labor unions were the only organizations supported to a significant extent. The part-time farms were primarily a market for surplus labor, the average return for labor spent on the farm being only 12.7 ct. per hour. Renting a farm gave as high an economic return as owning a farm, with much less capital required.

A study of migration into Oregon, 1930–1937.—I, Net migration and population estimates, V. B. Stanbery (*Portland: Oreg. State Planning Bd., 1938, pp. [6]+96, pls. 2, figs. 4*).—This first volume of the study discusses the migration total and net into the State and different parts of the State since 1930; makes comparisons of the migration since 1930 with that during the period 1920–30 as to rate, age of migrants, family composition, and distribution; and makes analyses of the sources and former occupations of the migrants and their distribution into cities and rural areas. The chief sources of data were the U. S. Census, records of births and deaths published by the Oregon State Board of Health, and the annual school censuses. The reliability of the school censuses as a basis for estimating migration and population changes and the methods employed in their use in the study are discussed.

Rural households and dependency, O. F. Larson (*Colorado Sta. Bul. 444 (1938), pp. 48, figs. 5*).—This is a comparative study of composition and behavior of 357 relief and 714 nonrelief households in Baca, Elbert, and Larimer Counties, Colo. It gives the data applying to Colorado obtained in a Nationwide study made by the Federal Emergency Relief Administration, and is designed to show in what ways, if any, the rural households receiving public emergency relief in October 1933 differed from their nearest neighbors who did not receive such relief. Analyses are made on the basis of occupation, residence, age of male household heads, family types, age and sex distribution, workers per family, education, unemployment, farm property owned, and part-time farming. The geographic and occupational mobility of the household is also analyzed.

Of the households engaged in agriculture, a relatively large proportion were farm tenants and laborers and a smaller proportion farm owners in the relief group than in the nonrelief group. In the nonagricultural occupations the relief group had a relatively larger proportion of unskilled laborers and a smaller proportion of skilled workers, proprietors, and clerical workers than the non-relief group. Heads of relief households tended to be under 35 or over 54 yr. of age, while those of nonrelief households were more frequently from 35 to 54 yr. of age. Broken families comprised 11 percent of the relief and 4 percent of the nonrelief households. Households on relief averaged about one-half person larger than the nonrelief households and contained more than one-third more children under 16 yr. of age. Of all relief persons 46 percent were under 16 yr. of age as compared with about one-third of the nonrelief population. Male heads of relief households averaged 6.5 grades of school and those of nonrelief households about 8 grades. Only half as many relief as nonrelief male heads, excluding farm operators, were employed on October 1, 1933. Relief heads for nearly every age group had had more unemployment since 1920. Farm operators on relief operated much smaller farms and had less livestock than those not on relief in 1933. Heads of relief families had moved from county to county more frequently since about 1914. The ratio of advances to set-backs on the "agricultural ladder" was 38 percent better for nonrelief than for relief heads.

The influence of the central rural school on community organization, E. T. STROMBERG (*[New York] Cornell Sta. Bul. 699 (1938), pp. 39, figs. 10*).—Fifteen communities in New York State in which central rural schools had been in operation for 5 yr. or more were studied to ascertain the effect of the centralization of the schools on community organization. The bulletin discusses the added services and advantages of the central school, changes in high school enrollment, the central school and tax rates, the school and organizations of the area, the parent-teacher association, the school and the trade area, the school and neighborhoods or small communities within the central district, the school and improvement of roads, the movement for centralization, the central school as a community center, the school district in terms of an area of acquaintance, village-country relations, and the central school and community organization.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Farm organization and management, G. W. FORSTER (*New York: Prentice-Hall, 1938, pp. XVI+432, [pl. 1], figs. [67]*).—In the preparation of this textbook an attempt has been made "to integrate general economic principles, as they apply to farm management, with sound farm practices." Included are chapters on the nature of modern farming; the nature of farm management; the development of farm management; the problems of farm organization; factors affecting the choice of farm enterprises; selection and combination of farm enterprises—general principles, method of substitution, and method of direct comparison; the standard combination of farm enterprises; using the standard systems; specialized and diversified farming; units of measurement (of size of business, factors of production, diversification, productiveness, capacity and efficiency, and success of farm business); the economics of farm practices; farm layout; size of the farm; selection and acquisition of the farm; selection and acquisition of farm implements and machinery; the differential nature of management; the management of labor and working capital; new forms of management in agriculture; economic reports as aids to management; the share rental contract; the cash rental contract; and credit for farm operation. Questions and references follow each chapter.

FOODS—HUMAN NUTRITION

[Studies in foods and nutrition of the Tennessee Station], F. L. MacLeod and E. Utley (*Tennessee Sta. Rpt. 1937, pp. 34–37*).—This progress report (E. S. R., 77, p. 418) includes data on the vitamin A content of sweetpotatoes, turnips, rutabagas, and carrots, and a summary of experiments on the utilization of calcium metaphosphate and rock phosphate by the white rat.

Proteins of the black bean of the Mayas, Phaseolus vulgaris, D. B. Jones, C. E. F. Gersdorff, and S. Phillips. (U. S. D. A.). (*Jour. Biol. Chem., 122 (1938), No. 3, pp. 745–755*).—The chief proteins, α- and β-globulins, of the "black turtle soup" bean (*P. vulgaris*) were isolated, and the nitrogen, sulfur, and amino acid contents were compared with those of other beans of the *Phaseolus* group. In general the proteins of the different beans are very similar in composition, with the exception that the lysine content is less and the histidine content considerably higher in the globulins of the black bean. Since the black bean is the chief supplement to corn in the diet of the Mayas, the authors compared the amino acid composition of the two foods and found that the black bean contains relatively large amounts of lysine, tryptophan, histidine, and cystine, all of which are low in the corn proteins.

The nutritional value of various protein fractions of the peanut, H. D. Baernstein. (Univ. Wis.). (*Jour. Biol. Chem., 122 (1938), No. 3, pp. 781–789, figs. 5*).—The growth-promoting values of whole, defatted peanuts and of the total protein and total globulin contents were tested by biological assay on rats.

The control rats receiving 20 percent casein in the basal diet had an average daily growth rate of 3.4 g, as compared to 4.2 g for the rats receiving whole, ground, defatted peanuts as the protein source. The rats receiving total protein, total globulin, and conarachin at the 20-percent level had growth rates equivalent to that on casein. Arachin alone proved inadequate, and with methionine produced a growth rate only one-half that shown by the casein-fed rats. The further addition of tryptophan produced better growth. In the absence of methionine the use of arachin with tryptophan, lysine, or cystine as the protein source failed to produce adequate growth.

Proteolytic activity in relation to the blackening of potatoes after cooking, A. F. Ross and W. E. Tottingham. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 6, pp. 433–441, figs. 4*).—In continuation of a previous study (E. S. R., 77, p. 724), the authors investigated the action of proteolytic enzymes as a causal factor in the blackening of cooked potatoes. Autolysis tests and amino nitrogen and tyrosine determinations were made on samples of normal and abnormal tubers of the same variety and size frozen with solid carbon dioxide. In some of the tests papain was added to increase the enzyme concentration and in others potassium chloride to increase the potassium content and sodium chloride in an attempt to increase the content of soluble protein. In other digests the amount of protein was increased by the addition of either potato protein or gelatin.

An increase of nearly 30 percent in amino nitrogen and about 40 percent in tyrosine equivalent was found in discoloring potatoes as compared with normal ones. The rate of proteolysis was not increased by the addition of sodium chloride, nor did the addition of potassium chloride serve to suppress the rate. In both types of tubers the added proteins were hydrolyzed at about equal rates, indicating that the increase of free amino nitrogen in discoloring tubers is not due primarily to abnormal activity of proteolytic enzymes. The rate of proteolysis was increased somewhat more in the digest of discoloring potatoes than of normal potatoes, in the presence of papain. "These results are interpreted as indicative of either decreased stability of proteins or increased proportions of lower polypeptides as causal factors in the increased free amino acid content of the abnormal tubers."

Culinary quality of apple varieties grown in Minnesota, A. M. CHILD and R. BRAND (*Minnesota Sta. Tech. Bul. 128 (1938), pp. 23, figs. 2*).—Quality tests were made on 13 fall and early winter, and 30 winter, varieties of Minnesota apples and 7 of crabapples grown in 1935 and 1936. The fall apples were kept in cold storage at 34° F. and the winter varieties in a storage cellar at 34°–38° until tested. The apples were made into pie, sauce, jelly, and baked or glazed, and the products were judged by a panel of judges. H-ion concentration, viscosity, pectin content of the juice, and flavor tests were made on the apple jellies. The apple pies were rated for color, shape, juiciness, and flavor; the baked apples for color, shape, juiciness, tenderness, and flavor; and the apple sauce for consistency, color, finish, and flavor.

The results show that the quality and condition of the fruit, including degree of ripeness, are important factors in cooking quality. The same varieties of apples did not vary significantly in quality in the two crops. Fruits of very good quality made better cooked products than did poor or medium grade fruits of the same variety. The jellies made from McIntosh, Wealthy, Wolf River, Cortland, Haralson, Hawkeye, and Minnehaha varieties were rated "very good." The sauces made from Wolf River, Colorado Orange, Haralson, Hawkeye, Jewell Winter, Jonathan, Northwestern, and Yellow Belleflower varieties and the pies containing apples of the Haralson, Jewell Winter, Jonathan, King Davis, and Sharon varieties were also rated very good. Only two varieties, the Duchess and the Boiken, were rated very good when baked, while none was rated "poor" in pie and only 1 variety made poor jelly, 8 made poor sauce, and 4 were judged poor when baked. The remainder were rated "fair" or "good" in cooking quality.

The value of milk in the diet, W. E. KRAUSS (*Ohio Sta. Bimo. Bul. 194 (1938), pp. 165–167*).—The author discusses the nutritive value of the various constituents of milk in this review paper.

Validity of milk and honey diet in human nutrition, M. H. HAYDAK. (Univ. Minn.). (*Bee World, 18 (1937), No. 1, pp. 8–11*).—For 12 weeks an adult man remained on a diet composed of 1 qt. of milk and 100 g of honey, with a little sodium chloride dissolved in water and occasionally 1 drop of 10 percent potassium iodide solution, following a transition period during which the test diet taken 7 times a day was gradually substituted for the regular three meals a day. Hemoglobin readings, weight changes, and urine analyses for sugar and proteins were made weekly.

The hemoglobin content of the blood changed from 12 to 13 g per 100 cc, the weight remained practically constant, and sugar and protein were absent from the urine. Symptoms of scurvy which appeared at about the eighth week were cured when the diet was supplemented by 500–700 cc of orange juice daily. The subject reported no feeling of sluggishness or tiredness during the test period and the ability to work was not impaired.

A study of the relation between the retail prices of some specific foods and the amounts, styles, and containers in which they are purchased (*Vermont Sta. Bul. 438 (1938), p. 28*).—Progress on this project is briefly noted.

Cold storage lockers welcomed by farmers generally, D. K. Tressler (*Farm Res.* [*New York State Sta.*], *4* (*1938*), *No. 4, pp. 10, 11*).—The author discusses the development of locker storage for meats, fruits, and vegetables, and points out some of the precautions to be observed in preparing and storing the various foods.

Biological thought and chemical thought: A plea for unification, F. G. Hopkins (*Lancet* [*London*], *1938, I, Nos. 21, pp. 1147–1150; 22, pp. 1201–1204*).—The author reviews the progress which biochemistry has made during the past 50 yr., particularly with regard to the nature of the intracellular enzymes and their mode of action in making the potential energy of foodstuffs available for the activity of living cells and the relationships that exist between the constitution and the functions of some of the hormones and vitamins.

An easily constructed rat metabolism apparatus which automatically records oxygen consumption and animal activity, E. L. Schwabe and F. R. Griffith, Jr. (*Jour. Nutr., 15* (*1938*), *No. 2, pp. 187–198, figs. 2*).—The apparatus described is a modification of the automatic microspirometer in which water is siphoned into a burette as rapidly as the oxygen is withdrawn from it by the test animal, with a continuous graphic record of the oxygen consumption added to permit the selection and accurate measurement of strictly basal intervals in the test run. The minimum error in single runs is less than 1 percent for oxygen and slightly over 1 percent for carbon dioxide.

The effect of prolonged exposure to low temperature on the basal metabolism of the rat, E. L. Schwabe, F. E. Emery, and F. R. Griffith, Jr. (*Jour. Nutr., 15* (*1938*), *No. 2, pp. 199–210*).—Using the apparatus described in the paper noted above, metabolism tests were made on female rats which were kept 16 hr. a day for 15, 30, and 60 days and on male rats kept for 60 days in a room at a temperature ranging from 7.8° to 12.2° C. (46° to 54° F.). The rats were fasted for 24 hr. before the test runs, which were made with the animal chamber at a temperature of from 28° to 30°. At least two 30-min. runs were made with each rat.

The rats exposed longer than 15 days in the cold room had a retardation in growth of 11 percent for the 60-day and 4 percent for the 30-day females and 9 percent for the 60-day males. The basal metabolism of the 60-day females increased 12.4 percent, the 30-day females 12.7, and the 15-day females 11.4 percent, and of the 60-day male rats 10.1 percent. The calories per 100 g of body weight per 24 hr. increased 16.1 percent, 15, 11.1, and 14.8 percent, respectively, in the four groups. The respiratory quotient was not affected and averaged 0.755 for all animals. The body temperature increased 1.1° for the 30-day females, 0.7° for the 15-day females, and 0.5° for the 60-day males. The authors suggest that some of the apparent sex difference noted may be attributed to the ability of the male rat better to withstand cold than the female.

Metabolism studies with rats suffering from fat deficiency, G. O. Burr and A. J. Beber. (Univ. Minn.). (*Jour. Nutr., 14* (*1937*), *No. 6, pp. 553–566, figs. 6*).—In continuation of previous studies (E. S. R., 66, p. 390), the authors used an open circuit apparatus to compare the basal metabolic rates of rats on the stock ration and on a fat-free ration with and without added oil. All rats received dried yeast supplements and concentrates of vitamins A, D, and E. One group of rats was starved for 16 hr. before being placed in the metabolism cage and samples of gas exchange were collected during the next 8 hr. of fasting, the ration and supplements were given, and the test run was continued for the rest of the 24-hr. period. A second group was not starved before the test run and samples were taken before a 24-hr. period of starvation.

The third group was studied for 48 hr. without starvation, the supplements and ration being given at the end of 24 hr. From 4 to 11 test runs were made on each rat.

The results show that when food was available the fat-starved rats maintained an average respiratory quotient above 1 for from 16 to 20 out of 24 hr. Even in periods when food was withheld the metabolic rate was highest between 8 p. m. and 4 a. m. and lowest during the day, although the metabolism chamber remained dark during the entire test period. The rise of metabolic rate following the administration of the yeast supplement, which reached 44 percent over the starvation rate in the fat-starved rats and later dropped to 14 percent, with the respiratory quotient still over 1, and finally to 1 percent with a respiratory quotient of 0.94, indicates that the early digestive action on certain foods demands a great increase in metabolism, while later utilization may be carried on at a basal level of energy exchange. The minimum respiratory quotient was attained after from 12 to 16 hr. of starvation and the minimum metabolic rate after 20 hr. of starvation.

Recovery following suppression of growth in the rat, M. F. Clarke and A. H. Smith (*Jour. Nutr., 15 (1938), No. 3, pp. 245–256, fig. 1*).—In continuation of previous studies (E. S. R., 74, p. 569), the authors investigated the effect upon subsequent growth of reducing the mineral salts and limiting the source of energy in the diet of young male rats. The rats were maintained on the low salt diet for 3-, 6-, and 12-week periods and then on an adequate diet for from 6 to 12 weeks. The criteria used were the increase in weight and length of the body and in the weight of the kidneys, testes, spleen, femurs, and incisors.

The rats maintained on the restricted diets for the shortest time exceeded the control rats' weight after 9 weeks on the adequate diet. Those maintained for longer periods of time on the restricted diets failed to regain losses incurred during the period of suppressed growth, although during the latter part of the period on the adequate diet the rats were exhibiting good weight gains and gave some indications that complete recovery would ultimately occur. The growth of the axial skeleton ceased and that of the appendicular skeleton proceeded at about half the control rate on the restricted diets. The subsequent growth in length of body was influenced more by the previous restriction of inorganic salts than by the reduction of the energy intake. During the salt-restricted period the kidneys and testes continued to grow and the kidneys tended to become hydrated and the spleen atrophied. On the calorie-restricted diet atrophy of the spleen also occurred. During the period of realimentation, all of the body organs returned to nearly normal size with respect to body weight at the time the rats were placed on the adequate diet.

A method for the preparation of posthemolytic residue or stroma of erythrocytes, S. S. Bernstein, R. L. Jones, B. N. Erickson, H. H. Williams, I. Avrin, and I. G. Macy (*Jour. Biol. Chem., 122 (1938), No. 2, pp. 507–514*).—In continuation of previous studies (E. S. R., 78, p. 279), the authors describe a procedure for the preparation of stroma which is based upon hemolysis of the erythrocytes and prolonged washing of the stromata with sodium citrate buffered at pH 5.5. Stroma samples from bovine, horse, sheep, human, and avian erythrocytes were prepared by this method.

The samples from different species showed definite variations in physical and chemical properties. The human samples contained from 14 to 34 percent hemoglobin, from 39 to 59 protein, from 10 to 12 fat, 5 ash, from 0.06 to 0.11

organic iron, and from 0.04 to 0.17 percent inorganic iron and yielded from 0.56 to 1.07 g of posthemolytic residue per 100 cc of erythrocytes.

The lipid distribution of posthemolytic residue or stroma of erythrocytes, B. N. Erickson, H. H. Williams, S. S. Bernstein, I. Avrin, R. L. Jones, and I. G. Macy (*Jour. Biol. Chem., 122 (1938), No. 2, pp. 515–528*).—In continuation of the investigation noted above, the authors studied the total fat, free and ester cholesterol, neutral fat, and phospholipid content of the intact erythrocytes and of the stroma preparations from the different species. The human erythrocytes contained 424 mg of total lipids per 100 g, of which 58 percent was phospholipid, 12 percent neutral fat, 7 percent cholesterol esters, and 23 percent free cholesterol. The composition of human posthemolytic residue prepared by the sodium citrate buffer method was as follows: Protein from 39.4 to 59 percent, total lipids from 10.4 to 12 percent, of which from 58 to 72 percent represented phospholipids, from 3 to 17 percent neutral fat, from 0 to 6 percent cholesterol esters, and from 16 to 25 percent free cholesterol. The protein: lipid ratio ranged from 3.8 to 5.3 in the three samples studied. The lipid contents of the cow, sheep, and horse posthemolytic residues were very similar to those of the human.

Determination of cephalin in phospholipids by the estimation of choline, H. H. Williams, B. N. Erickson, I. Avrin, S. S. Bernstein, and I. G. Macy (*Jour. Biol. Chem., 123 (1938), No. 1, pp. 111–118*).—In continuation of studies noted above, the authors describe a method for use in estimating the cephalin content of the blood and tissue phospholipids from different species on the basis of the choline: phosphorus ratio. With the exception of avian blood, cephalin appears to be the chief phospholipid in the erythrocyte and red blood cell stroma and only a small part of the phospholipid content in the plasma.

The use of fibrin in synthetic diets, J. H. Jones (*Jour. Nutr., 15 (1938), No. 3, pp. 269–275, fig. 1*).—The author reports that the addition of 18 percent beef blood fibrin as the sole source of protein to a synthetic diet consisting of 70 percent dextrinized starch, 6 yeast, 4 salt mixture No. 40, and 2 percent agar and supplemented by cod-liver oil produced normal growth in young rats. No toxic symptoms were produced in rats maintained for 12 weeks on a diet high in fibrin. The crude, unpurified fibrin fed at the level of 18 percent contained sufficient vitamin A to produce normal growth in vitamin A-depleted rats. After extraction with alcohol the fibrin was ineffective in preventing the development of xerophthalmia within about 5 weeks, and was also shown to contain little or no vitamin B_1. The administration to rats of rations consisting of 10 percent alcohol-extracted fibrin, 3 percent calcium carbonate, and 1 percent sodium chloride, with 86 percent yellow corn or 76 percent commercial yellow corn meal plus 10 percent wheat embryo produced the same degree of rickets as did the Steenbock-Black rickets-producing diet No. 2965, which is slightly higher in phosphorus. The use of crude fibrin prevented the symptoms of vitamin D deficiency.

Factors possibly influencing the retention of calcium, phosphorus, and nitrogen by infants given whole milk feedings.—I, The curding agent, P. C. Jeans, G. Stearns, J. B. McKinley, E. A. Goff, and D. Stinger (*Jour. Ped., 8 (1936), No. 4, pp. 403–414, figs. 5*).—The authors studied the retentions of nitrogen, calcium, and phosphorus during 108 balance periods on 18 infants receiving curded whole milk and on 4 receiving unacidified evaporated milk with 6 percent dextrin-maltose mixture, 1 teaspoonful of cod-liver oil containing approximately 350 U. S. P. units of vitamin D, and the customary additions of orange juice, egg yolk, and sieved fruits and vegetables. The infants were from about 7 to 28 weeks of age.

The 10 infants receiving boiled fresh whole milk curded with lactic or citric acid had daily calcium retentions varying from 0.02 to 0.088 g, phosphorus from 0.013 to 0.05, and nitrogen retentions from 0.051 to 0.44 g, as compared to 0.022 to 0.075 g, 0.015 to 0.057, and 0.042 to 0.26 g, respectively, for 8 infants receiving milk curded with a pepsin-rennin preparation, and from 0.01 to 0.065 g, 0.017 to 0.045, and 0.07 to 0.238 g per kilogram of body weight, respectively, for 4 infants receiving the unacidified evaporated milk mixture. Roentgenograms of the wrist and ankle showed normal development and bone calcification, and growth in length and weight gains were normal or above for all infants. It is concluded that the amounts of nitrogen and minerals available for retention are the same for any given intake of milk curded by the addition of acid or enzymes or altered by the heat treatment of evaporation.

The retentions of nitrogen, calcium, and phosphorus of infants fed sweetened condensed milk, H. E. Harrison (*Jour. Ped., 8 (1936), No. 4, pp. 415–419*).—The nitrogen, calcium, and phosphorus retentions were studied in five infants from 4 to 7 mo. of age receiving in the first test period diluted sweetened condensed milk providing 10 percent of the calories in the form of protein and in the second period a cow's milk mixture providing 15 percent of the calories in protein, supplemented by 30 cc of orange juice and 8 cc of cod-liver oil daily. One infant was studied during a third period on a feeding of diluted evaporated milk without added sugar, which supplied 20 percent of the calories in protein. The total calories fed were sufficient to allow a normal weight gain and ranged from 100 to 120 calories per kilogram of body weight. On the sweetened condensed milk feeding the nitrogen intakes ranged from 4.02 to 4.47 g, calcium from 1.04 to 1.06, and the phosphorus intakes from 0.73 to 0.83 g, as compared to from 2.4 to 2.92 g, from 0.56 to 0.67, and from 0.42 to 0.55 g, respectively, on the cow's milk feeding, and 5.63 g, 1.37, and 1.02 g, respectively, on the evaporated milk without sugar feeding.

In all periods a satisfactory rate of weight gain ranging from 19 to 41 g per day was obtained. On the sweetened condensed milk feeding the nitrogen retention ranged from +0.82 to +1.22 g, calcium from +0.16 to +0.33, and phosphorus retentions from +0.14 to +0.24 g per day as compared to from +0.64 to +1.19 g, from +0.17 to +0.24, and +0.13 to +0.18 g, respectively, for the cow's milk feeding. The one infant receiving evaporated milk without sugar had a nitrogen retention of +0.8 g, calcium +0.24, and phosphorus +0.15 g per day. Only one infant had greater nitrogen and phosphorus retentions and another a greater calcium retention on the cow's milk feeding supplying 15 percent of the calories in protein than on the sweetened condensed milk feeding which contained less protein. It is concluded that the protein, calcium, and phosphorus requirements of the infants were met when 10 percent of the calories were provided by protein.

The biochemistry of magnesium deficiency, I, II, E. V. Tufts and D. M. Greenberg. (Univ. Calif.). (*Jour. Biol. Chem., 122 (1938), No. 3, pp. 693–714, figs. 6; pp. 715–726, figs. 5*).—Two papers are presented.

I. *Chemical changes resulting from magnesium deprivation.*—The authors studied the effects of magnesium deprivation upon rats receiving diets prepared from washed casein, sucrose, and hydrogenated cod-liver oil, with vitamin A, B, G, and D supplements and a purified salt mixture free from magnesium. The diets contained from 0.4 to 5 mg of magnesium per 100 g as compared to 50 mg in the control diet. The blood, tissues, and body constituents were analyzed for magnesium and calcium after from 12 to 105 days on the diets.

Within a few days after the rats were placed on the low magnesium diets changes occurred in the magnesium and calcium contents of the body and blood, and the rats exhibited symptoms of vasodilatation, hyperemia, and hyperexcitability, followed by nutritional failure, cachexia, and kidney damage. As the growth rate declined the animals showed loss of hair, the presence of a rough and sticky coat, ringed eye dermatitis, diarrhea, and finally edema. In the rats receiving 2 mg or less of magnesium per 100 g of food, the effect on growth was proportional to the magnesium intake. During the prolonged depletion the rats on the low magnesium diets had a reduction in body magnesium content to about two-thirds the normal level and an increase in body calcium content to 1⅓ times the normal level. The decrease in body magnesium content is attributed to a reduced rate of accumulation rather than an actual loss of the mineral.

II. *The minimum magnesium requirement for growth, gestation, and lactation, and the effect of the dietary calcium level thereon.*—The basal diet supplemented by 5 mg of magnesium per 100 g of food was fed to three groups of rats. The rats showed satisfactory growth and were bred successfully at from 80 to 120 days of age. The young rats had an average birth weight of 5 g, but few survived, as in most cases the mothers refused to nurse them and either let them starve or devoured them. The results suggest that when the calcium content of the diet is under 0.9 percent and the phosphorus content is 0.8 percent or less the level of 5 mg of magnesium per 100 g of food is on the borderline of the dietary requirement. The young rats that survived had a normal magnesium content at birth, but developed a deficiency in body magnesium during lactation which was accompanied by vasodilatation and hyperexcitability.

When the calcium content of the diet was increased to 1.16 and 1.66 percent it was necessary to raise the magnesium level to 13 mg per 100 g of food in order to get normal growth in the male rats and slightly below normal in the females, with still some evidence of magnesium deficiency and a low magnesium content in the blood plasma and the red blood corpuscles and in the body, accompanied by an increase in the body calcium content. The reproductive performance on the high calcium diets was very poor, with resorption of the fetuses. Increasing the vitamin G content of the diet did not prevent the occurrence of the symptoms of malnutrition produced by the diet containing only 1.5 mg of magnesium per 100 g of food or less.

On the form of copper in blood plasma, R. Boyden and V. R. Potter. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 122 (1938), No. 2, pp. 285–290*) —The total copper content of oxalated whole blood from a cow was determined. Aliquots of the blood plasma with and without acid were dialyzed against distilled water for 24 hr. at from 2° to 4° C., and the dialyzable copper content was determined.

The total copper content of seven samples of blood varied from 10.5 to 12.7 μg per 10 cc of plasma. In the absence of acid from 5 to 12 percent of the copper was dialyzed and from 75 to 106 percent nondialyzed. The additional percentage over 100 was due to unavoidable contamination amounting to about 1 μg of copper. In the presence of acid the dialyzed copper content varied from 0 to 52 percent and the nondialyzed from 61 to 101 percent. When the acid concentration was increased the dialyzed copper content ranged from 24 to 84 percent and the nondialyzed from 33 to 90 percent. The greatest dialysis of the copper took place in the presence of sulfuric acid.

Is cobalt of any significance in the treatment of milk anemia with iron and copper? E. J. Underwood and C. A. Elvehjem. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 124 (1938), No. 2, pp. 419–424*).—The addition of as much as 0.1

mg of cobalt daily to rats made anemic on the whole milk anemia-producing diet, as previously described (E. S. R., 67, p. 90), supplemented by 0.05 mg of copper, 0.02 of manganese, and 0.5 mg of purified cobalt-free iron, did not appreciably increase the growth rate or hemoglobin regeneration. The hemoglobin levels of six rats receiving the diet supplemented by the purified iron for about 3 mo. ranged from 13.61 to 16.01 g per 100 cc as compared to a range of from 14.73 to 16.01 g for three rats receiving an unpurified iron supplement and from 16.01 to 18.64 g per 100 cc for five rats receiving the purified iron supplement plus from 0.1 to 0.15 mg of cobalt daily. By analysis the cobalt content of the milk was found to be from 8 to 18 μg per liter.

It is concluded that iron, copper, and manganese are the only mineral supplements required by rats on the anemia-producing milk diet, and that the small amounts of cobalt which contaminate iron salts are not significant in the treatment of milk anemia in the rat. The authors estimate the cobalt requirement of the rat to be less than 0.6 μg per day.

The trace element content of the newborn rat (as determined spectrographically), L. L. Rusoff and L. W. Gaddum. (Fla. Expt. Sta.). (*Jour. Nutr., 15 (1938), No. 2, pp. 169–176*).—By spectrographic analysis of 14 newborn rats from six different litters and of the stock diet of the mothers, it was found that all rats contained aluminum, barium, copper, manganese, strontium, tin, and zinc, 11 contained lead, 10 silver, 6 chromium, 3 nickel, and 1 rat contained molybdenum. The stock diet contained titanium in addition to the elements present in the rat ashes with the exception of silver. The authors suggest that the first eight elements given above may be transmitted from the mother to the young rat.

A method of increasing precision in vitamin A assay, P. P. Swanson, G. T. Stevenson, and P. M. Nelson. (Iowa Expt. Sta.). (*Jour. Nutr., 15 (1938), No. 2, pp. 103–123*).—The procedure followed in an investigation reported previously (E. S. R., 64, p. 585) was varied in this study in that female rats only were used, the stock colony ration was standardized, the yeast supplement was fed separately, and the following criteria were used for judging the vitamin A depletion: (1) Maintenance of constant weight for a period of 5 days and incipient xerophthalmia, (2) maintenance of constant weight for 4 days and slightly advanced xerophthalmia, (3) severe xerophthalmia only, and (4) a drop in body weight of 4 or more grams sustained for 2 days. The 557 test animals inbred by brother-and-sister matings for 65 generations were given upon depletion of their vitamin A stores from 1 to 3 Sherman units of vitamin A in the form of carotene, canned tomato, or sweetpotato daily for 8 weeks. The data were subjected to statistical analysis.

The standard deviation of the gain in weight of 10 lots of rats, which represented 49 series of tests on 439 rats grouped according to the level and the supplement fed, fell within from 17 to 20 g and averaged 18.1 g in 9 of the groups. From the calculation of multiple correlation coefficients, it was found that 6 depletion history factors contributed the most important information about weight gains in the test period. The following equation was obtained for use in determining the estimated gains in weight during the test period:

$$\overline{X}=107.24-0.38A-1.74B-0.54C-3.46D+1.16E+0.18F$$

where A is the weight in grams at weaning, B the number of days required for depletion, C the total gains in grams during depletion, D the number of days of constant weight at end of depletion period, E the gain or loss in weight in grams during the critical period, F the weight of total food intake in grams during the depletion, and $\overline{X}$ the estimated gain in grams during the test period.

Upon the application of this equation to the 557 test rats, 50 percent of the group fell within the range of the mean gain, 34.8 g ± 5 g, the standard deviation of their gains in the test period being 16.1 g. That is, after the unsuitable rats were discarded the standard deviation dropped from 18.1 to 16.1, which represents an increase of 26 percent in the information supplied by the experiment. The elimination of the unsuitable rats did not affect the normality of the distribution of the remaining data. The figure 16.1, therefore, is designated as the laboratory standard deviation and represents the measure of the approximate variation to be expected in any assay conducted in the authors' laboratory under similar test conditions.

The data for the first 5 weeks of the test period were reanalyzed and a standard deviation of 13.9 was obtained, and the following regression equation was calculated: $\bar{X}=76.88-0.28A-1.31B-0.23C-1.23D-0.36E+0.09F$. The rats with an estimated weight gain varying more than 4 g from the mean, 29.3 g, were eliminated and the standard deviation decreased to 12 g, which represents an increase of 127 percent over the information supplied by the 8-week test. This means that in comparing test groups composed of from 15 to 20 rats differences in mean gains of from 7 to 8 g can be considered significant. The figure 12, therefore, is designated as the laboratory standard deviation for a 5-week period when the less desirable animals are eliminated.

The regression equation was successfully applied to data obtained on a group of 28 rats depleted of vitamin A in the routine manner, and an erratic response was predicted for 15 rats. The other 13 rats were given a vitamin A supplement and showed a mean gain of 27.5 g, with a standard deviation of 10.5. Data from another experiment were reanalyzed, and when tested with the regression equation 12 rats were discarded as being overdepleted. The irregular rats had a mean gain of 13.6 g and a standard deviation of 17.7 as compared to a mean gain of 30.4 g and a standard deviation of 8.9 for the remainder of the group. The authors recommend the inclusion in the final assay of only a predetermined portion of the depleted rats and the use of a 5-week test period.

Comparison of vitamin B_1 content of raw and evaporated milk by the 10-day bio-assay method, A. L. Daniels (*Soc Expt. Biol. and Med. Proc., 38 (1938), No. 2, pp. 212–216*).—Using a modification of the 10-day bio-assay method of Schlutz and Knott (E. S. R., 78, p. 427), the author, with the cooperation of M. F. Deardorff and D. R. Linn, studied the vitamin B_1 content of raw Guernsey milk and commercial evaporated milk diluted 1:1. The purified vitamin B_1-free ration consisted of 20 g triple precipitated alcohol-extracted casein, 54.5 g cane sugar, 19 g Crisco, and 3.5 g Wesson's salt mixture and supplemented by 2 drops of cod-liver oil and in one of the tests by 0.5 g of whey autoclaved 2 hr. at 120° C. The raw milk tests were made in June and July, and the evaporated milk was obtained from lots purchased in July, December, and January.

The rats receiving the basal diet supplemented by 7.9 cc of raw milk showed an average daily weight gain of 1.45 g, as compared to 1.5 g for the rats receiving 7.8 cc of raw milk and the whey supplement and 2.25 g for the rats receiving 6.8 cc of raw milk supplemented by 0.5 g of autoclaved yeast. The rats receiving 21.2 cc of evaporated milk supplemented by 0.5 g of whey had an average daily weight gain of 1.68 g as compared to 1.51 for the rats receiving 7.2 cc of evaporated milk supplemented by 0.5 g of whey and 4γ Betaxin. It is concluded that commercial evaporated milk contains about 60 percent less vitamin B_1 than raw summer milk.

Studies on the mode of action and the metabolism of vitamin D, [I], W. HEYMANN (*Jour. Ped., 8 (1936), No. 4, pp. 480–488, figs. 2*).—This and the following four papers comprise a series of studies on vitamin D metabolism.

The results are given of phosphorus and calcium determinations on the blood of rabbits which had received 20 cc of viosterol in oil, equivalent to approximately 1.6 mg of irradiated ergosterol, by stomach tube. On the fifth to the tenth days after the administration of the viosterol 0.6 cc of the rabbit blood serum was injected daily for 10 days in rats maintained on the Steenbock rickets-producing diet No. 2965. Control rats were injected with serum from healthy rabbits which had not received the viosterol supplement. Serum samples from rabbits receiving viosterol were also administered to rachitic rats at intervals between 1 and 11 weeks following the viosterol dose.

Approximately 5 days after the viosterol had been given the inorganic phosphorus content of the rabbit blood serum increased, while the calcium level remained practically unchanged. The rachitic rats were cured by the administration of the serum from rabbits receiving viosterol, while serum from the control rabbits was ineffective. As long as from 2 to 3 mo. after the administration of the single dose of viosterol, detectable amounts of vitamin D were present in the serum of the rabbits.

Metabolism and mode of action of vitamin D.—II, Storage of vitamin D in different tissues in vivo, W. HEYMANN (*Jour. Biol. Chem., 118 (1937), No. 2, pp. 371–376*).—At intervals between 1 and 12 weeks after the administration to rabbits of a single dose of 20 cc viosterol in oil by stomach tube the animals were killed and the presence of vitamin D was determined in various tissues and organs and in the blood plasma by feeding tests on rachitic rats. Serum phosphorus and calcium determinations were made on the blood from the rats. Vitamin D was stored in the rabbit brain for from 1 to 2 weeks, the erythrocytes from 5 to 6, the small intestine from 5 to 8, the large intestine from 6 to 8, the abdominal skin from 6 to 8, the lungs and kidneys from 6 to 9, the liver from 6 to 12, and in the blood plasma from 8 to 12 weeks or longer.

Metabolism and mode of action of vitamin D.—III, Importance of the liver for its antirachitic efficacy, W. HEYMANN (*Amer. Jour. Diseases Children, 55 (1938), No. 5, pp. 913–923, figs. 4*).—After about 1½ weeks on the Steenbock rickets-producing diet No. 2965, one group of rats was subjected to an operation on the common bile duct to produce obstructive biliary cirrhosis, and in another group the liver was damaged by the intramuscular injection of carbon tetrachloride. About 1½ weeks later one group of rats was given by intramuscular injection from 5 to 360 U. S. P. units of vitamin D in the form of viosterol in oil diluted with cottonseed oil, a second group was given from 5 to 40 U. S. P. units of crystalline vitamin D_2 in the form of Drisdol, and a third group received from 0.1 to 0.2 cc of a 10-percent solution of sodium glycerophosphate daily. After 8 to 10 days of treatment the healing of the rickets was determined from roentgenograms, and on the eleventh day the rats were killed and the livers were examined and phosphorus and calcium determinations made on the blood serum.

The rachitic rats suffering from obstructive biliary cirrhosis and jaundice required from 10 to 12 times as much vitamin D in the form of viosterol in oil or Drisdol given by intramuscular injection as was needed by the control rats to cure the rickets. The injection of the glycerophosphate solution produced the same amount of healing in the jaundiced rachitic rats as in the control rats, and it is concluded that the calcifying properties of the osteogenetic cells are not impaired in jaundice. From 2 to 3 times as much vitamin D in the form of viosterol in oil was needed to cure the rickets in rats which had received carbon tetrachloride as was needed for the control rats. It is concluded that the impairment in hepatic function was responsible for the decreased antirachitic potency of vitamin D, and consequently that the liver plays an important role in the antirachitic functioning of vitamin D.

Metabolism and mode of action of vitamin D, IV, V, W. Heymann (*Jour. Biol. Chem., 122 (1937), No. 1, pp. 249–262*).—These papers continue the series.

IV. *Importance of bile in the absorption and excretion of vitamin D* (pp. 249–256).—Three dogs with ligation and transection of the bile duct, six with obstructed bile duct, and two with gall bladder fistula were given 200,000–250,000 U. S. P. units of vitamin D as viosterol in oil or as Drisdol by stomach tube or by intravenous injection. From 0.3 to 0.5 cc of the blood serum of the dogs was injected intramuscularly into rachitic rats daily for 10 consecutive days. Roentgenograms were used to show the degree of healing of the rickets, and phosphorus and calcium determinations were made on the blood serum of the dogs and the rats. The presence of vitamin D in the dog bile was detected by similar feeding tests on rachitic rats.

The results show that vitamin D cannot be absorbed unless bile is present in the chyme, since no vitamin D was found in the blood serum of the dogs with ligated and transected bile ducts and the blood inorganic phosphorus content remained unchanged. In the serum of the two control dogs vitamin D was circulating for about 10 mo. after the administration of viosterol in oil and for from 1 to 4 mo. after Drisdol was given, accompanied by an increase in inorganic phosphorus content of the blood. When viosterol in oil was injected, the eight remaining test dogs excreted negligible amounts of vitamin D in the bile and rather large amounts when Drisdol was given. It is suggested that the chemical nature of the solvent influences the excretion of vitamin D from the liver tissue into the bile.

V. *Intestinal excretion of vitamin D* (pp. 257–262).—When 250,000 U. S. P. units of vitamin D in the form of viosterol in oil or of Drisdol were administered by stomach tube to three dogs with obstruction of the common bile duct, vitamin D was found in the feces for from 10 to 16 days as compared to from 6 to 8 mo. in two healthy dogs. Intramuscular injection of 200,000–250,000 units of vitamin D in both forms to three dogs with the bile duct ligated resulted in excretion of vitamin D through the intestinal wall within 5 days. Analysis of the intestinal content of seven dogs in which the bile duct had been occluded or a gall bladder fistula established before the vitamin D was injected intramuscularly revealed that the vitamin D, regardless of the solvent, was excreted through the walls of the small intestine and to the greatest extent in the upper third of the tract.

Growth-stimulating action of alpha tocopherol, H. M. Evans and G. A. and O. H. Emerson. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 2, pp. 197, 198*).—In continuation of the study noted previously (E. S. R., 79, p. 152), the authors fed 6 times weekly for 50 days 1 mg of α-tocopherol dissolved in 80 mg of ethyl laurate to 6 female rats reared on the vitamin E-low diet 427 until 195 days of age. The control rats received 80 mg of ethyl laurate alone. The test rats had an average gain in weight of 22 g as compared to 0 for the control rats. When a single dose of 3 mg of the α-tocopherol was administered to 4 rats of proved sterility, 4 litters were born, averaging 5.5 young per litter with an average birth weight of 5.3 g and having 6 still-born young. On a 1-mg dose only 2 litters were produced by 5 female rats, averaging 9.5 young per litter with an average birth weight of 5.4 g and no still-born young.

Effect of autoclaving on vitamin potency of nicotinic acid, S. G. Smith and G. and L. H. Margolis (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 2, pp. 251–254, fig. 1*).—The nicotinic acid dissolved in distilled water was autoclaved for 2½ and 5 hr. at 15 lb. pressure. Ten dogs were placed on the Goldberger diet 123 until blacktongue developed and were then divided into five groups. One in each pair was given orally autoclaved nicotinic acid and the other received the unautoclaved nicotinic acid in doses varying from 1 to 10 mg per kilogram of body weight. Very little, if any, of the vitamin potency of the nicotinic acid was destroyed by autoclaving, since the mouth symptoms in all dogs healed quickly, the body weight increased, and the average length of time at which blacktongue symptoms reappeared after treatment ended was 17 days for the autoclaved and 16 days for the unautoclaved solution.

Toxicity of nicotinic acid, K. K. Chen, C. L. Rose, and E. B. Robbins (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 2, pp. 241–245*).—The minimal lethal dose of nicotinic acid and of nicotine was determined in white mice, white rats, and guinea pigs. Solutions of the test materials were neutralized with sodium carbonate and administered by intravenous injection. Two adult dogs were given 2 g of nicotinic acid in capsule form daily, and four dogs were given 1, 0.5, 0.2, and 0.06 g daily by mouth 5 times a week for 8 weeks.

The minimal lethal dose of nicotinic acid expressed in milligrams per kilogram of body weight was 4,500 in mice and 3,500 in the rats and guinea pigs as compared to 0.8, 1, and 4.5 mg. respectively, for nicotine. The two dogs receiving the large doses of nicotinic acid died, but those on the smaller doses exhibited no ill effects.

Effect of nicotinic acid on increased porphyrinuria occurring in seven painters, E. S. Gross, Y. Sasaki, and T. D. Spies (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 2, pp. 289–292*).—In continuation of previous studies (E. S. R., 79, p. 572), the amount of porphyrin in the urine of seven painters was determined daily during a 3-day control period, followed by a 9-day period when 2 doses of 200 mg of nicotinic acid dissolved in 200 cc of water were given daily, and for 14 days after the treatment with nicotinic acid had been discontinued. A group of 45 young male adults served as control subjects. During the 3-day period all of the painters showed a strongly positive test for porphyrin in the urine. After the 9-day period a negative reaction was obtained, and during the subsequent 14 days without nicotinic acid supplement the test again became positive. Twelve of the control subjects had a positive porphyrin test which the authors attribute to the ingestion of alcohol and to dietary irregularities.

Experiments with pigs on a pellagra-producing diet, [I], II (*Biochem. Jour., 31 (1937), No. 11, pp. 2065–2069, figs. 2; 32 (1938), No. 5, pp. 844–854, figs. 3*).—This study is in two parts. In the first, by T. W. Birch, H. Chick, and C. J. Martin, 15 weanling pigs on a blacktongue-producing diet consisting of 83 parts whole white corn, 11 pea meal, 4.4 purified "Glaxo" casein, 3 cod-liver oil, and 2.5 parts salt mixture containing 2 parts calcium carbonate, 2 bone ash, 1 sodium chloride, and 0.08 part ferric oxide were divided into five groups and given (1) the diet unsupplemented and with (2) 8 parts of dry yeast in place of corn and the casein decreased to 2.2 parts, (3) 20 parts whole wheat and 63 parts whole barley in place of corn and the casein increased to 5.3 parts, (4) the casein increased to 7 parts, and (5) 7 parts unpurified "light white" substituted for Glaxo casein. After 5 weeks, 2 pigs on diet 5 were given 2 mg of lactoflavine daily. The basal diet, with and without from 0.5 to 1 g autoclaved yeast supplement and 14γ pure lactoflavine supplement daily, was also tested on groups of young rats.

During the first 6 weeks the pigs on diet 1 had an average weekly weight gain of 3.5 lb. as compared to 3.6 lb. for the pigs on diet 4, 5 lb. on diet 5, 5.3 lb. on diet 3, and 8 lb. on diet 2. Thereafter the pigs on diet 2 with the yeast removed continued to gain, while the surviving pigs on the other diets showed weight losses or very slight gains. The pigs on diet 1 had unhealthy scurfy skins, those on diets 3 and 5 had diarrhea, and a simple anemia occurred in all pigs not receiving yeast. The addition of 4 percent yeast restored growth and cured 3 pigs on diets 1 and 5, 11 percent dried whey product cured the 2 pigs on diet 2, autoclaved yeast extract equivalent to from 5 to 6 percent dry yeast cured 2 pigs on diets 4 and 5. The 3 pigs on diet 3 recovered spontaneously. The remaining 5 pigs died after from 6 to 8 weeks or became ill and were killed at the tenth week. Autopsy examination revealed a cellular inflammation of the mucous membrane of the cecum and large colon, which is characteristic of pigs dying of infectious enteritis or pig paratyphoid. No pathogenic organisms were present.

The rats showed normal growth on the corn diet alone and with the supplements. After 8 weeks the animals were mated and normal healthy young were produced. Replacement of the whole white corn by "straight run" wheaten flour and by bolted corn and restriction of the food intake resulted in subnormal growth and evidence of lactoflavine deficiency. The addition of yeast extract restored the rats to normal.

It is concluded that dry yeast and autoclaved aqueous yeast extract carry the active factor required by the pig to prevent weight loss and dermatitis, with accompanying anemia and diarrhea. The active principle appears to be present in the whole wheat and barley mixture in an amount just sufficient to support growth. The rat appears to be less sensitive to the nutritive defect in the experimental diet which produces blacktongue in dogs and the disorder found in the pigs.

In part 2, by H. Chick, T. F. Macrae, and A. J. P. and C. J. Martin, the authors conducted further experiments on 19 pigs maintained on the basal diet for from 2 to 4 weeks before the administration of one of the following supplements to different groups: Riboflavine, unfractionated autoclaved yeast extract, the filtrate from the extract after treatment with fuller's earth, the washed clay, the eluate of the fuller's earth adsorbate with weak alkali, the alcoholic extract of dried yeast, and nicotinic acid. Groups of rats on two basal diets consisting of whole corn 77 parts, corn gluten 21, and salt mixture 2.5 parts, and whole corn 88 parts, purified casein 9, and salt mixture 2.5 parts, with additional vitamins A, D, and B_1, were given autoclaved yeast extract, nicotinic acid, or nicotinamide alone and with riboflavine. In a second series of tests the whole corn in the diet was reduced to 50 parts, the purified casein increased to 11, and the rice starch to 35 parts, and the food intake was limited to 8 and 10 g daily.

The pigs receiving the supplements of dried yeast extracted with 95 percent alcohol and the eluate from the fuller's earth adsorbate recovered their normal growth rate and were cured of all symptoms, while 3 of 4 pigs receiving the fuller's earth containing the adsorbate grew and developed but at a subnormal rate, suggesting that the active material was not completely eluted in the alimentary tract. The 2 pigs receiving nicotinic acid showed dramatic cures. The bacteriological observations made on 5 pigs confirmed the conclusion drawn in the previous study that the primary cause of the ulceration and necrosis of the large intestine is nutritional and that the nutritional defect decreases the resistance of the mucous membrane to the invasion of nonpathogenic intestinal bacteria.

A litter of 10 weanling pigs was placed on the basal diet, with the corn content increased to 84.5 percent, the casein to 10 percent, and the ground peas omitted, and divided into three groups which received (1) the diet alone, (2) supplemented with 25 and 50 mg nicotinic acid, and (3) with 50 cc of yeast extract. After 9 weeks all the pigs were in good health and growing normally. The pigs consumed large amounts of wheat straw bedding and it is believed that the straw must have contained a sufficient additional amount of nicotinamide or some related compound of pyridine from which it could be derived. It is concluded that the addition of 60 mg of nicotinic acid daily renders the basal diet satisfactory for rearing pigs.

The results of the rat bio-assays confirm the findings of the previous study.

The curative action of nicotinic acid on pigs suffering from the effects of a diet consisting largely of maize, H. Chick, T. F. Macrae, and A. J. P. and C. J. Martin (*Biochem. Jour., 32 (1938), No. 1, pp. 10–12, pl. 1, fig. 1*).—In continuation of the study noted above the authors investigated further the active principle in autoclaved yeast capable of rendering the blacktongue-producing diet satisfactory for the rearing of young pigs. Two pigs receiving the basal diet consisting of whole white corn 77.5 parts, pea meal 10.5, purified "Glaxo" casein 6.5, cod-liver oil 3, and salt mixture 2.5 parts were given various fractions from yeast extract which proved ineffective, and both pigs continued to lose weight and developed severe diarrhea. The intramuscular injection of a solution containing 100 mg nicotinic acid in sodium hydroxide at pH 7.4 two and three times at intervals of 3 days resulted in the return of the pigs' appetites, abatement of the diarrhea, and definite weight gains within 24 hr. of the first injection, and by the end of 1 week the skin scabbiness had disappeared. The subsequent administration by mouth of 60 mg daily of nicotinic acid restored the pigs to a normal healthy state, with a new growth of hair within a period of about 6 weeks.

Modern views on pellagra, J. P. McGowan (*Brit. Med. Jour., No. 4033 (1938), p. 917*).—The author believes that the condition in the pigs described by Chick et al. in the two studies noted above is "one of the major sequelae of iron deficiency." It is suggested that yeast may contain, preformed as a nicotinic acid-containing body, a liver agent precursor that is equivalent in action to that of the intrinsic and extrinsic factors formed in the stomach and elaborated by the liver and is the active principle required by the young pig to prevent the disease.

Modern views on pellagra, W. J. Dann and Y. Subbarow (*Brit. Med. Jour., No. 4031 (1938), p. 809*).—The parallelism between the materials which are effective as preventive and curative agents for human pellagra and canine blacktongue is advanced as evidence that the two diseases are caused by a deficiency of the same substance. It is noted that the rat deficiency disease known as "rat pellagra" is etiologically different from the human disease and is not cured by nicotinic acid. Therefore, the results of tests with rat pellagra cannot be applied to human pellagra problems. The authors believe that the disease in pigs described by Chick et al. (and noted above) and the canine blacktongue are the only true analogues of human pellagra known today.

Dietary factors in periodontal disturbances, H. J. Leonard (*Jour. Amer. Dental Assoc. and Dental Cosmos, 25 (1938), No. 1, pp. 102–114*).—In this review paper the author discusses the ways in which dietary factors may affect the periodontal structure, such as the physical consistency of the food, the adherence of food materials on and between the teeth, the presence of food poisons which may lower the body's resistance to infection, the allergic nature of some foods to the gingivae, the food deficiencies which may lower tissue resistance to infection, and those which may lead to changes in the metabolism of connective tissue and bone. The dietetic control lies in teaching people to eat some foods which require vigorous mastication, to avoid at the end of a meal or between meals the sweet and starchy foods of a consistency likely to leave a residue on the teeth, and to keep the vitamins A, B, C, and D and the calcium and phosphorus contents of the diet high.

TEXTILES AND CLOTHING

Wool studies.—II, The frequency distribution of Merino wool fibre thickness measurements, A. P. Malan (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 9 (1937), No. 1, pp. 259–282, figs. 8*).—Data are presented to indicate the logarithmic nature of the distribution of fiber thickness measurements and the normality of the logarithms of such measurements, leading to the suggestion that the logarithms of fiber thickness could be satisfactorily used for statistical analysis of such wool data. This would mean replacing the arithmetical mean by the geometrical mean to represent average fiber thickness.

The influence of nutritional and climatic factors on wool growth and quality, I, II (*Canad. Jour. Res., 16 (1938), No. 6, Sect. D, pp. 153–173, fig. 1*).—Two studies were conducted at the University of Alberta.

I. *Statement of problem and experimental procedure,* J. P. Sackville and J. E. Bowstead.—Five trials each involving nine lots of sheep were conducted to determine the effects of humidity, temperature, date of shearing, plane of nutrition, and levels of protein and mineral intake on wool growth and quality. Effects were measured by determining differences in a wool sample from the right midshoulder at the beginning of the experimental period and one from the left midshoulder at the end of the experiment. Significant differences were effected by varying the shearing date and the plane of nutrition, while little or no effect of variations in temperature, humidity, or in levels of protein and mineral intake were evident.

II. *Laboratory methods used in the measurement of wool characters,* P. Larose and A. S. Tweedie.—The methods are described for determining crimp, staple length, fiber length, tensile strength, elongation, fiber diameter, moisture content, wool wax, suint, dirt, and yield of clean wool of the above-described samples.

Proposed minimum requirements of 3 types of upholstery fabrics based on the analysis of 62 materials, B. V. Morrison and M. B. Hays (*U. S. Dept. Agr. Circ. 483 (1938), pp. 28, figs. 5*).—Analyses for breaking strength; weight per square yard; number of yarns per inch and yarn twist, structure, size, and thickness; resistance to abrasion; and colorfastness to light were made under controlled conditions of temperature and humidity on 62 upholstery materials containing rayon, cotton, and mohair yarns. The materials were classified according to weave as 15 friezes, 21 rib weaves, 16 damasks and brocades, 5 velvets, and 5 novelties and were within the price range of from 69 ct. to $4.90 a yard. On the basis of a distribution diagram of the breaking strengths of the rib weaves and damasks, a tentative classification was made by taking the midpoint as the dividing line between the grades A and B, and the data on the other properties of the fabrics were then analyzed. For the friezes the distinguishing mark used was the all mohair content of the pile yarn in grade A fabrics and the presence of some cotton in grade B. With these divisions established, minimum requirements for breaking strength warpwise, fillingwise, and combined and for weight per square yard were set up for both the new and abraded damasks and rib weave materials. For the friezes the number of tufts per inch and the weight of the pile per square yard were also included. Fabrics failing to meet all the classifications set for grade A were placed in grade B, and those falling below the minimum standards of grade B were designated as substandard.

According to the minimum requirements proposed for either grade A or B of the friezes the breaking strength warpwise and fillingwise should be 95 and 80 lb. per inch, respectively, with a combined breaking strength of 180 lb. in the new material and 95 lb. lengthwise and 65 lb. crosswise per inch of cloth for the fabric after abrasion, with a combined breaking strength of 170 lb. The new fabric should weigh at least 15.5 oz. per square yard, with 365 tufts to the square inch, and the pile should weigh at least 5.5 oz. per square yard. The new grade A rib weave material should have a breaking strength of 90 and 85 lb. when new and 45 and 70 lb. after abrasion warpwise and fillingwise, respectively, with a combined breaking strength of at least 190 lb. for the new fabric and 130 lb. after abrasion and a weight of at least 11 oz. per square yard. The new grade B rib weave fabrics should have a breaking strength of 50 lb. lengthwise and 65 lb. crosswise, with a combined strength of 125 lb. and after abrasion more than 20 and 30 lb., respectively, with a combined strength of 55 lb. and a weight of not less than 8 oz. per square yard. The minimum breaking strength proposed for the damasks is 95 lb. both ways for the new fabric in grade A, with a combined strength of 200 lb. and after abrasion 50, 65, and 125 lb. for the lengthwise, crosswise, and combined breaking strengths, respectively. The weight should be at least 9 oz. per square yard. For the new grade B damask material, the minimum breaking strength proposed is 60 lb. both ways and a combined strength of at least 130 lb. and after abrasion 30 and 40 lb., respectively, with a combined strength of 80 lb. The weight should be at least 7.5 oz. per square yard.

Five of the friezes tested met the proposed standards, 4 of the rib weaves were classed as grade A and 4 as grade B, 3 of the damasks as grade A, and 3 of the damasks and brocades as grade B.

HOME MANAGEMENT AND EQUIPMENT

The shopping guide, compiled and edited by E. B. Weiss in collab. with M. Mermey (*New York and London: McGraw-Hill Book Co., [1937], pp. XI+301*).—The various chapters in this book have been written by department store research directors, merchandise managers, and buyers. Practical information is given on how to become a wise shopper for furniture, floor coverings, silver, china and glassware, sheets and blankets, table linen and towels, textiles, luggage, gloves, handbags, furs, millinery, and men's, women's, and children's clothing. A foreword is written by G. A. Whalen.

MISCELLANEOUS

Soils and men: Yearbook of Agriculture, 1938 (*U. S. Dept. Agr. Yearbook 1938, pp. [13]+1232, figs. 241, map 1*).—In addition to a large number of articles noted elsewhere in this issue there are included a foreword by H. A. Wallace; a tribute to C. F. Marbut (E. S. R., 73, p. 577); a summary article by G. Hambidge (pp. 1–19); a glossary of special terms (pp. 1162–1180); and a list of literature cited (pp. 1181–1207).

Agricultural investigations at the United States Field Station, Sacaton, Ariz., 1931–35, C. J. King, R. E. Beckett, and O. Parker (*U. S. Dept. Agr. Circ. 479 (1938), pp. 64, figs. 22*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Report on the agricultural experiment stations, 1937, J. T. JARDINE, W. H. BEAL, ET AL. (*U. S. Dept. Agr., Off. Expt. Stas., Rpt. Agr. Expt. Stas., 1937, pp. 226*).—Continuing earlier reports (E. S. R., 77, pp. 433, 894), the outstanding developments in experiment station work during the fiscal year ended June 30, 1937, are described, including the usual detailed statistics as to income, expenditures, personnel, and additions to equipment, and discussions of improved facilities, research projects and programs, coordination and cooperation, and similar matters. The bulk of the work (pp. 14–195) is again devoted to a review of recent station work, prepared by H. M. Steece, J. W. Wellington, H. P. Barss, F. V. Rand, H. W. Marston, G. Haines, E. C. Elting, W. A. Hooker, S. L. Smith, F. G. Hardin, B. Youngblood, and R. W. Trullinger. This review, while necessarily selective, "presents a few examples of station work considered to be of special significance at the present time."

Forty-fourth Annual Report [of Minnesota Station], 1937, W. C. COFFEY (*Minnesota Sta. Rpt. 1937, pp. 91*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Abstracts are also included of the following: Phytopathology and Its Future, by E. M. Freeman (pp. 12, 13); Experimental Design of Vertical Drop Culverts, by H. B. Roe (pp. 21, 22); Further Observations on the Quantitative Changes in the Microflora of Cream and Butter During Manufacture, Storage, and Shipment, by H. Macy (p. 25); New Species and Records of Mutillidae (Hymenoptera) From Borneo and the Solomon Islands, and New World Mutillidae in the Spinola Collection at Torino, Italy (Hymenoptera), both by C. E. Mickel (p. 26); Breeding Better Flax Varieties for Minnesota, by A. C. Arny (p. 28); A New Species of Smicromyrme From Japan (Mutillidae; Hymenoptera), by C. E. Mickel (p. 28); The Quality and Toxicity of Coal-Tar Creosote Extracted From Red Oak Ties After Long Periods of Service, With Special Reference to the Decay Resistance of Treated Wood, by H. Schmitz (p. 30); Experimental Durum Milling, by M. C. Markley (p. 33); American Commercial Beekeeping, by M. C. Tanquary and M. H. Haydak (p. 37); Herbs, Their Culture and Uses, by A. E. Hutchins and L. Sando (p. 39); Practical Experimental Milling, by M. C. Markley (pp. 39, 40); New Minnesota Fruits Named, by W. H. Alderman (p. 40); The Problem of Wind Erosion (p. 41), and The Color of Flour and Semolina (pp. 41, 42), both by M. C. Markley; Agricultural Research in China, by H. K. Hayes (p. 42); Arithmetic and Emotional Difficulties in Some University Students, by C. F. Rogers (pp. 42, 43), and Storm Damage on the Cloquet Forest (p. 43), and "Einzelstammwirtschaft" or Management of the Individual Tree (p. 44), both by T. S. Hansen.

Report of Puerto Rico Experiment Station, 1936 [trans. title], [A. LEE] (*Puerto Rico Sta. Rpt. 1936, Span. ed., pp. [2]+114, figs. 18*).—A Spanish edition of this report (E. S. R., 78, p. 577).

Fiftieth Annual Report [of Tennessee Station], 1937, [C. A. MOOERS ET AL.] (*Tennessee Sta. Rpt. 1937, pp. 58*).—The experimental work reported is for the most part noted elsewhere in this issue. Findings on the home production of food supplies, by J. J. Bird (pp. 9–11), are also included.

Fifty-first Annual Report [of Vermont Station, 1938], J. L. HILLS (*Vermont Sta. Bul. 438 (1938), pp. 35*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Arizona University and Station.—Frank A. Gulley, professor of agriculture and director of the station from 1890 to 1894 and subsequently engaged in farming for many years in Arizona and Illinois, died in Dearborn, Mich., August 26, 1938. Born in Dearborn on April 24, 1850, he entered the Michigan College in 1871, leaving in 1873 to operate the family farm when his father, Alfred B. Gulley, was appointed professor of practical agriculture. He returned in 1877 as assistant to Dr. W. J. Beal, was graduated in 1880, and received the M. S. degree in 1883. About 1880 he became professor of agriculture in the Mississippi College, remaining there until 1888 when he was appointed the first director of the Texas Station. In addition to this and other pioneer service, which included four widely separated States, he published in 1887 a textbook in elementary agricultural instruction entitled First Lessons in Agriculture.

Florida Station.—Dr. R. M. Barnette, connected with the chemical work of the station since 1925 and chemist since 1932, died November 1, 1938, following an automobile accident at the age of 38 years. A native of South Carolina, he was graduated from Clemson College in 1920, received the Ph. D. degree from Rutgers University in 1923, and had been for 2 years assistant chemist in the Tennessee Station. At the time of his death he was in charge of the land use division of the department of chemistry and soils. He had given much attention to the fundamental nutrition of plants, especially as influenced by the physical characteristics of the soil environment, and to the role of the minor elements in plant nutrition.

Georgia University.—Dr. John R. Fain, head of the agronomy department since 1907, retired on September 1, and has been succeeded by W. O. Collins, professor of soils.

Idaho University and Station.—Dr. W. M. Beeson, assistant professor and assistant in animal husbandry in the Arizona University and Station, has returned to Idaho as associate professor of animal husbandry in charge of animal nutrition and judging. Other appointments include Dr. D. E. Brady as assistant professor of animal husbandry in charge of animal genetics and meat instruction; Dr. Glenn C. Holm as animal pathologist vice Dr. Fred D. Maurer, resigned; and Howard B. Roylance as instructor in agronomy vice Donald E. Corless, resigned.

Louisiana Station.—F. L. Morrison has been appointed assistant in cattle and sheep breeding work to supervise experimental work with beef cattle and sheep now being undertaken in cooperation with a commercial firm at Lake Charles.

New Hampshire University and Station.—Pettee Hall, replacing the wooden agricultural engineering building, which burned in 1937, has been completed, and is in use by the university departments of agricultural engineering, home economics, and military science. Construction is under way on two new wings to Nesmith Hall, which will house station workers in entomology, horticulture, botany, soils and crops, and poultry.

Dr. George F. Potter, professor of horiticulture and horticulturist, has resigned to become a principal plant physiologist in the U. S. D. A. Bureau of Plant Industry. In this new position he will have general charge of the

Bureau's newly organized tung oil investigations, with a central office at Bogalusa, La., and regional offices located in the Gulf States.

Oklahoma Station.—In connection with the research project on anaplasmosis, a new barn, 156 ft. long by 26 ft. wide, has recently been constructed on the college farm. In planning this structure, the two chief objectives were to make it as insect proof as possible and to provide for possible further expansion. The floor is of concrete, and the walls are of brick. A concrete moat completely surrounds the structure, all doors and windows are screened, and instead of opening directly into the feed alley each stall opens into a small entry or baffle, which is also screened. Animals taken into the barn can be washed and sprayed in a vestibule before being led into the stalls. The new barn will make possible a repetition of earlier work on transmission of anaplasmosis by horseflies and to test the connection of other insects and ticks under conditions that can be more thoroughly controlled than was possible in the pioneer experiments of Sanborn.

A third unit of the station greenhouse has been completed, 212 ft. long by 32 ft. wide. Space has been allotted to the departments of horticulture, entomology, agronomy, and botany.

A farm wheat improvement program has been initiated in cooperation with grain men, millers, and bankers of the State. The purpose of this program is to promote the planting of adapted wheat seed to the end that the quality of Oklahoma wheat will be improved in general marketing and milling qualifications.

Dr. Max Jennings Plice has been appointed associate professor of agronomy, and Dr. Michel Afanasiev associate professor of horticulture. Other appointments include the following assistant professors: Dr. Gladys Marie Kinsman in home economics research, Dr. William Winfield Ray in botany and plant pathology, and J. Lee Brown in horticulture.

Utah College and Station.—Dr. A. L. Wilson, associated with the department of horticulture since 1931 and its head since 1935, died October 30, 1938, at the age of 52 years. A native of Utah, he was graduated from the college in 1916, later receiving the M. A. degree in 1924 and, from Cornell University, the Ph. D. degree in 1931.

Washington Station.—Harry L. Garver, investigator in farm electricity, and Carl P. Heisig, assistant agricultural economist, have resigned to accept positions with the U. S. Department of Agriculture. The former has been succeeded by W. A. Junnila. Dr. Ross H. Hurt has been appointed to the new position of assistant veterinarian and will devote his time to diseases of poultry.

American Society of Agronomy.—This society held its thirty-first annual meeting in Washington, D. C., from November 16 to 18, 1938, with an attendance considerably in excess of 700. The address of President Emil Truog was entitled Putting Soil Science to Work, and dealt especially with the pioneer contribution to soil management and conservation of Edmund Ruffin (E. S. R., 67, p. 336). Among other speakers was Under Secretary of Agriculture M. L. Wilson, whose topic was Soils, Crops, and People.

The officers for the ensuing year include the following: President, R. J. Garber; vice president, F. J. Alway; chairman of the crops section, F. D. Keim; chairman of the soil section and president of the Soil Science Society of America, W. A. Albrecht; secretary-treasurer, G. G. Pohlman, Morgantown, W. Va.; and members of the executive committee, E Truog and F. D. Richey. W. H. Pierre, Ames, Iowa, was elected secretary of the Soil Science Society. The fellows elected were W. H. Pierre, I. P. Trotter, and C. S. Willard.

EXPERIMENT STATION RECORD

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PROGRESS IN THE ORGANIZATION OF THE FEDERAL RESEARCH LABORATORIES FOR NEW AND EXTENDED USES OF FARM COMMODITIES

In its deliberations concerning the farm problems of the Nation, the Seventy-fifth Congress gave consideration to means of alleviating and correcting conditions unfavorable to agriculture and especially to the opportunities for finding new and extended uses for surplus agricultural commodities through research. This interest and consideration culminated in the inclusion in the Agricultural Adjustment Act of 1938 of a clause, known as section 202, which reads, in part, as follows: "The Secretary [of Agriculture] is hereby authorized and directed to establish, equip, and maintain four regional research laboratories, one in each major farm producing area, and, at such laboratories, to conduct researches into and to develop new scientific, chemical, and technical uses and new and extended markets and outlets for farm commodities and products and byproducts thereof. Such research and development shall be devoted primarily to those farm commodities in which there are regular or seasonal surpluses, and their products and byproducts."

Although the act thus provided for the establishment of a regional research laboratory in each of the four major producing areas, the delimitation of these areas devolved upon the Federal Department of Agriculture. Immediately upon the passage of the act on February 16, 1938, a departmental committee was set up to consider the matter. The recommendations of the committee led to an announcement by Secretary Henry A. Wallace, through a press release of August 15, which designated both the four areas and the farm commodities which are to receive initial research attention by each laboratory. In the southern area were included Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, Oklahoma, South Carolina, and Texas, and the farm commodities specified for initial research attention were cotton, sweetpotatoes, and peanuts. The eastern area was made up of New England, Delaware, Kentucky, Maryland, New Jersey, New York, North Carolina, Pennsylvania, Tennessee, Virginia, and West Virginia, and the commodities for initial research attention were tobacco, apples, potatoes, milk products, and vegetables. The northern area comprised Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin, and the commodities for initial research attention were corn, wheat, and agricultural waste products. The western area included the 11 States remaining, and the commodities for initial research attention were fruits, other than apples, and vegetables, potatoes, wheat, and alfalfa.

The press release also called attention to the fact that plans were being considered for a conference in each of the areas to consult with research institutions and representatives of producers and of industries as to the research work on the commodities named for initial research attention. In preparation for these conferences specialists of the Department familiar with the technical field of industrial utilization of farm commodities devised tentative skeleton outlines of proposed major objectives for research applied to the farm commodities designated by the Secretary for initial attention. Eventually, conferences were held in the northern area at Chicago, Ill., September 2, 1938; in the western area at Salt Lake City, Utah, September 14 and 15; in the southern area at Birmingham, Ala., September 19; and in the eastern area at Washington, D. C., September 29. At each of these conferences the pertinent provisions of the act, the regional areas, and the primary commodities selected for inclusion in the program were the subjects of a discussion led by Dr. J. T. Jardine, Director of Research. A preliminary report of a survey of the research already being carried on was presented for each area, and the major objectives of the tentative research program were outlined by Dr. Henry G. Knight, Chief of the Bureau of Chemistry and Soils.

In discussing the legislative provisions for the four research laboratories before the regional conferences, Dr. Jardine said, in part: "This is a challenge to all of us. . . . The Department recognizes the responsibility of considering this program on a Nation-wide basis. For the purpose of serving the greatest national and regional good, the laboratories should be prepared for a vigorous attack upon such materials as fats and oils, protein, fibers, and carbohydrates that arise from surplus agricultural commodities. We need to know what is being done in these fields and how work under way and new work may be coordinated into an initial research program for effective work on commodities which most require aid now."

Meanwhile steps were being taken to determine the location of the laboratories within the areas as provided in supplementary legislation embodied in the annual Agricultural Appropriation Act of June 16, 1938. As already noted (E. S. R., 79, p. 290), this act authorized the utilization of not to exceed $100,000 of funds available under the Agricultural Adjustment Act of 1938 to conduct a survey to determine the location of the laboratories as well as "the scope of the investigations to be made, and to coordinate the research work now being carried on."

A memorandum of July 14 set up a special survey committee of the Department to assist in carrying out these provisions and outlined its duties as follows: "(1) To conduct a survey of all research activities relating to the industrial utilization of agricultural products in the four regional areas to be served by the four regional laboratories, such survey to include a study of research projects of the Department of Agriculture and other Federal agencies, the State experiment stations, educational institutions, privately endowed research institutions, commercial consulting research laboratories, and the research laboratories maintained by industries based wholly or in part on utilization of agricultural raw materials, and report their findings to the Department; (2) to assemble facts bearing upon suitability of proposed laboratory locations and make report thereon to the Department; (3) to make recommendations to the Department as to the scope of investigations to be undertaken in these laboratories and as to ways in which the research recommended may be coordinated with other activities in the same field."

With the generous cooperation of administrative groups and specialists in each of the bureaus of the Department, the survey committee proceeded to organize survey groups consisting of four directors, one in each of the four areas, with assistants to contact research organizations of the area. Outlines covering the information desired from public and private research agencies as to active and suggested research were prepared and used for the guidance of the survey groups in their personal contacts with representatives of 1,300 institutions in the 4 areas, including about 1,100 industrial research laboratories. An outline of criteria for the consideration of advantages of locations for the laboratories was formulated and applied to more than 200 locations which requested consideration. The final step was the preparation of a report of the survey covering active phases of research, suggested problems for the laboratories, and a broad outline of a coordinated research program covering the commodities designated for initial research attention.

On December 14, a press release announced the general location of the four laboratories. The northern regional laboratory was located in Peoria, Ill., and the southern laboratory in New Orleans. The sites for the western and eastern laboratories were definitely designated on January 11 and 19, 1939, respectively, as a 20-acre tract at Albany, near San Francisco, Calif., and a 32-acre tract in Wyndmoor, Springfield Township, adjoining the city of Philadelphia.

Prior to these developments, other aspects of the work of organization received attention under a memorandum of Secretary Wallace of October 6, 1938, which designated responsibilities for the operation and coordination of research under the laboratories, as follows: "I am assigning the principal operating functions of the four regional laboratories to Dr. Henry G. Knight, Chief of the Bureau of Chemistry and Soils. . . . The work of other research bureaus will be involved to some extent at the regional research laboratories—especially the commodity bureaus. Dr. J. T. Jardine, Director of Research, will be responsible for the development and continuous coordination of a departmental research program for the laboratories as authorized by the act."

This announcement supplemented an appointment as of August 20 of Mr. H. T. Herrick as Assistant Chief of the Bureau of Chemistry and Soils, to have general supervision of the chemical and chemical engineering work in the four laboratories. On December 16, the laboratory directors were announced as follows: Northern laboratory, Dr. O. E. May; southern laboratory, Mr. D. F. J. Lynch; eastern laboratory, Mr. P. A. Wells; and western laboratory Dr. T. L. Swenson.

The initial development of the laboratory program has not lacked public interest and cooperation. Communications and briefs from sponsors of more than 200 proposed locations have shown a genuine interest and faith in the opportunities for extending industrial uses for farm commodities through research. Equal interest and cooperation have marked the survey contacts with representatives of farm organizations, industrial research groups, and public institutions engaged in related research. Each of these groups has been generous in its suggestions of problems peculiar to the commodities which have been designated for initial research attention and others in which there is special interest. Some of the suggestions have to do with substitute crops considered of industrial value, and others concern special crops which could not at present be included under the provisions for surplus crops.

The records of the survey are being given careful study with reference to active research and with reference to recent scientific advancement on such primary products as fats and oils, proteins, carbohydrates, and textile fibers to develop promising leads as a basis for a vigorous coordinated research program leading to new and extended uses for farm commodities.

In launching upon this phase of the program the Department is aware of the need for continued interest and cooperation of the best technical thought within the Department and throughout related interests in the Nation.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The pectic substances, R. Řípa (*Die Pektinstoffe. Braunschweig (Brunswick): Serger & Hempel, 1937, 2. ed., pp. 404, figs. 11*).—This is a more or less historically arranged treatment of the outstanding work on pectins and related substances directed primarily to the practical worker but intended also to be of use to the chemist entering this field.

Changes in the phosphatide content of crude soybean oil during storage, G. E. Halliday. (Ind. Expt. Sta.). (*Oil & Soap, 14 (1937), No. 4, pp. 103, 104*).—When crude soybean oil was stored from 3 to 112 days in carload lots there was a progressive settling out of phosphatides. When moisture was introduced into the oil, yellowish hydrated phosphatides separated out at an accelerated rate.

The relation between the rate of granulation of clover honey and its water content, E. I. Fulmer, O. W. Park, and J. C. Williams. (Iowa Expt. Sta.). (*Iowa State Apiarist Rpt., 1935, pp. 62, 63*).—The authors found that the granulation tendency decreased with increasing levulose content, but they do not consider the addition of levulose to be a practical solution to the granulation problem, for the present at least. They further found that water contents less than about 8.3 percent or more than about 20 percent stabilized the honey against granulation.

The reaction of hydrogen cyanide with sulfuric and phosphoric acids, A. W. Cobb *and* J. H. Walton. (Univ. Wis.). (*Jour. Phys. Chem., 41 (1937), No. 3, pp. 351–363, figs. 2*).—The authors found hydrocyanic acid to form complexes with sulfuric, phosphoric, and selenic acids. The formulas of the first two complexes are $HCN{\cdot}H_2SO_4$ and $HCN{\cdot}H_3PO_4$. The most probable structure of these compounds seemed to be that of an imide group replacing the hydroxyl group in formic acid and one of the hydroxyl groups of the sulfuric acid or phosphoric acid. The rates of formation and of thermal decomposition of these compounds was also investigated.

The isolation of a toxic substance from the culture filtrate of Trichoderma, R. Weindling and O. H. Emerson. (Calif. Citrus Expt. Sta. et al.). (*Phytopathology, 26 (1936), No. 11, pp. 1068–1070*).—A crystalline substance lethal to hyphae of *Rhizoctonia solani* in dilutions up to 1:300,000 (about two-thirds the toxicity of mercuric chloride) was obtained by extracting *T. lignorum* cultures with chloroform and recrystallizing the extracted material from benzene or from 95 percent alcohol.

The substance was found toxic to the *Trichoderma* species producing it as well as to the *Rhizoctonia* species, but the minimum lethal dose for the *Trichoderma* was about 40 times that for the *Rhizoctonia.*

The compound has a composition corresponding fairly well with $C_{14}H_{16}N_2S_2O_4$, but the molecular weight determination was difficult because of low solubility and heat instability of the compound. After recrystallization the substance decomposed at from 219° to 222° C. It is levorotatory, $[\alpha]_D^{19°} = -239°$ in its chloroform solution. The compound is moderately to slightly soluble in the usual solvents. It is nonbasic in spite of its nitrogen content. It is readily oxidized, easily altered by alkalies, and yields sulfur in sulfide form on boiling with 5 percent aqueous potassium hydroxide.

The highest yields (up to 70 mg per liter of filtrate) have thus far been obtained when the fungus was grown for 2 days under the conditions of strong aeration, high acidity of the medium (pH 3.0–4.0), and ammonium tartrate as the nitrogen source.

A demonstration of the necessity for care in sampling, B. L. Herrington. (Cornell Univ.). (*Jour. Chem. Ed., 14 (1937), No. 11, p. 544*).—The author issued to advanced students in quantitative analysis samples consisting of rather coarsely ground potassium chloride with granulated sugar of much smaller particle size, without calling attention to the impossibility of sampling such a mixture accurately without further grinding. Subsequently the difficulty encountered in securing consistent results was explained.

Some facts concerning vacuum-oven moisture determination, J. E. Anderson. (Kans. Expt. Sta.). (*Cereal Chem., 13 (1936), No. 4, pp. 437–452, figs. 5*).—Error due to moisture losses from samples stored in screw-cap bottles is less than that from other losses. One and one-half hr. were required to heat dried samples to oven temperature in the air-jacketed vacuum oven. The steam-shelf heating device heated dried samples to oven temperature in less than 10 min., and the required drying time was reduced to 4–6 hr. when this device was used. Losses of moisture during grinding could be reduced to a minimum either by conditioning or partially drying the samples previous to grinding. Keeping the dishes almost closed while in the oven and closing as soon as the oven door was opened eliminated errors due to exposure to the mosture in the air.

Apparatus for evaporating solutions on electrodes, H. A. Wilhelm. (Iowa State Col.). (*Indus. and Engin. Chem., Analyt. Ed., 10 (1938), No. 6, p. 327, figs. 2*).—A pipette of gooseneck form, from which the solution to be evaporated may be forced dropwise onto an electrode, and a support and heater for the electrode, are described. The apparatus as illustrated is a battery of 20 units.

Electrolytic silver wool in the filling of microcombustion tubes, W. MacNevin. (Ohio State Univ.). (*Indus. and Engin. Chem., Analyst. Ed., 10 (1938), No. 6, p. 341*).—Clusters of relatively long and very thin crystals of silver may be obtained electrolytically. Such crystals were found superior to silver wire or wire gauze, presenting much more surface per unit of weight.

A copper tube preheater, W. MacNevin and H. S. Clark. (Ohio State Univ.). (*Indus. and Engin. Chem., Analyst. Ed., 10 (1938), No. 6, pp. 338, fig. 1*).—A small compact coil is formed in a length of copper tubing about 5 mm in outside diameter and of a wall thickness of about 1 mm, the coil being simply and rigidly supported over a wing-top burner. The inlet and outlet ends of the tubing are bent downward and are provided with water jackets above the rubber tubing connections. The organic impurities in the ordinary laboratory supply of compressed air were converted by this means into absorbable compounds so effectively as to permit the use of the air thus purified for the purposes of microanalysis.

Viscosity measurement, M. R. Cannon and M. R. Fenske. (Pa. State Col.). (*Indus. and Engin. Chem., Analyt. Ed., 10 (1938), No. 6, pp. 297–301, figs. 3*).—This paper disusses the operating characteristics of simple modified Ostwald viscometers that are suitable for covering a wide range of viscosity with accuracy. The important sources of error in capillary viscometers are analyzed briefly and equations for computing the necessary corrections are given.

An automatic continuous percolator, M. S. SCHECHTER and H. L. HALLER. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed., 10 (1938), No. 6, p. 328, fig. 1*).—The authors, finding that large Soxhlet extractors are rather expensive and often do not work so efficiently or smoothly as the small ones, constructed, to overcome these difficulties, an automatic percolator which is simple, compact, inexpensive, and efficient, and when once regulated will operate for long periods without requiring attention and with very little loss of solvent. The apparatus is illustrated in a diagram.

A photoelectric colorimeter, K. HABE and R. E. PHIPPS. (Cornell Univ.). (*Science, 88 (1938), No. 2276, pp. 153, 154, figs. 2*).—Some difficulties with the single-cell construction, which requires a constant light source, arise from the variations in the current produced by the cell, these variations being caused, in turn, by fatigue effects and changing temperature. These difficulties can be avoided or minimized by using a variable resistance and a galvanometer as a null-point indicator to balance the output of two photoelectric cells connected in opposition. An instrument based upon these principles and capable of being constructed at a cost, for parts and materials, of about $100 is described. The instrument has been used with satisfactory results in the determination of creatinine by its reaction with an alkaline picrate.

The sensitization of paper strips with filtered mercuric bromide solution in the Gutzeit method of arsenic analysis, R. S. ROSENFELS. (Calif. Expt. Sta. and U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 3, pp. 493–496, fig. 1*).—Filtration permits the use of a relatively large quantity of mercuric bromide solution for sensitization without the necessity for discarding it soon after it is first used. The solution can be filtered and used repeatedly for at least 3 or 4 mo. at a considerable saving of time and materials.

Precipitation of calcium in the presence of ammonium molybdate and iron, R. C. WILEY and A. YEDINAK. (Univ. Md.). (*Indus. and Engin. Chem., Analyt. Ed., 10 (1938), No. 6, pp. 322, 323*).—Both calcium and phosphorus are determined on the same sample. Calcium may be determined accurately by precipitating it as the oxalate and titrating with potassium permanganate after removing the phosphorus as ammonium phosphomolybdate. Moderate amounts of iron do not interfere. Ammonium molybdate does not interfere with the quantitative precipitation of calcium in the presence of a moderate amount of acetic acid and ammonium oxalate.

Titration of small quantities of fluorides with thorium nitrate.—I, Effect of changes in the amount of indicator and acidity, D. DAHLE, R. U. BONNAR, and H. J. WICHMANN. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 3, pp. 459–467, figs. 2*).—The comparison made between the additions of thorium solutions dropwise and all at one time showed that the resultant color of the lake is practically the same in each case. Variations in the amount of indicator used resulted in different values for the titer of the thorium solution and in a difference in the size of the blank. Variations in the acidity of the solution to be titrated for fluorine caused varying size of the blank, varying titer of the thorium solution, and errors approximately proportional to the change in pH and the amount of fluorine present. A pH range 2.5–3.0 gave satisfactory results in titrations of quantities up to 50 μg of fluorine.

The solubility of indium in mercury from 0° to 50° C., W. G. PARKS and W. G. MORAN. (R. I. State Col.). (*Jour. Phys. Chem., 41 (1937), No. 3, pp. 343–349, fig. 1*).—In the temperature range from 0° to 50° the solubility is represented by the equation, $\log N_2 = \frac{53.57}{T} + 1.714$, N_2 being the weight fraction of indium in the saturated amalgam. From the general behavior of indium amalgam the authors believe it to be suited for precise e. m. f. measurements.

Application of the dithizone method to the determination of lead in biological materials, E. P. Laug. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 3, pp. 481–487, fig. 1*).—Phosphates must be removed almost completely in order to prevent precipitation of lead in a form not extracted by dithizone. Interference by small quantities of stannous tin was prevented by preliminary oxidation to the stannic condition. No interference due to reduction of stannic to stannous tin by dithizone was observed. Dithizone and lead-dithizone solutions in chloroform were found to be quite stable when stored in the dark, but they decomposed readily under the influence of light. The dithizone method gave accurate results for direct analysis of biological materials containing lead ranging in quantity from less than 1γ to 100γ.

Iodometric microdetermination of selenate in the presence of selenite, H. A. Pagel and J. C. Miers. (Univ. Nebr.) (*Indus. and Engin. Chem., Analyt. Ed., 10 (1938), No. 6, pp. 334, 335, fig. 1*).—The authors modified the procedure based on the oxidation of hydrochloric acid in distillation with selenic acid, adding a reflux condenser to the distillation apparatus and sealing an inlet for carbon dioxide into the bottom of the distilling flask. Bromides and iodides must be excluded because they are oxidized by selenious acid as well as by selenic acid.

Report on zinc, R. A. Caughey, E. B. Holland, and W. S. Ritchie. (Mass. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 2, pp. 204–207*).—A satisfactory separation of zinc as the diphenylthiocarbazone complex, with a colorimetric determination of the zinc in the form of its "dithizone" compound, was shown to be made possible by first eliminating a considerable part of the interfering metals. The recommended procedure is stated in working detail.

Determination of zinc: A colorimetric micromethod, W. L. Lott. (Cornell Univ.). (*Indus. and Engin. Chem., Analyt. Ed., 10 (1938), No. 6, pp. 335–338, fig. 1*).—A colorimetric microdetermination of the zinc content of agronomic materials is applicable for the determination of quantities of zinc ranging from 0.05 to 1 mg. After a preliminary separation of the zinc from interfering elements, 5-nitroquinaldic acid is used as a precipitating agent. The precipitate is filtered from the excess reagent and converted into an orange-colored water-soluble compound by reduction with stannous chloride. The intensity of color is measured by means of a photoelectric colorimeter.

Precipitation of zinc by 5-nitroquinaldic acid was shown to be complete within a range of from pH 2.5 to 8.0 after digestion for 30 min. Ammonium chloride and sodium chloride in concentrations greater than 0.7 N inhibited the complete precipitation of the zinc. The intensity of color of the reduction product of 5-nitroquinaldic acid is independent of the acid concentration at acidities lower than 0.8 N and of the concentration of stannous chloride. The intensity of color increases appreciably with rise in temperature of the solutions, making it necessary to carry out all readings at the same temperature.

Micromethods of quantitative organic elementary analysis, J. B. and V. Niederl (*New York: John Wiley & Sons; London: Chapman & Hall, 1938, pp. XVI+271, figs. 53*).—Certain changes in F. Pregl's micromethods to permit their use by chemistry students without previous training in microchemical technic have been tested for a number of years and are here presented in book form.

The improved Soiltex method for determining the reaction of muck soils, C. H. Spurway. (Mich. State Col.). (*Mich. Muck Farmers Assoc. Proc., 18 (1936), pp. 18, 19*).—This is a very brief note on a demonstration of a reaction indicator mixture improved to cover the extended range, pH 3.0 to 9.0.

Practical suggestions for the preparation of standard solutions for protein testing, W. O. WHITCOMB. (Mont. Expt. Sta.). (*Cereal Chem., 13 (1936), No. 6, pp. 718–720*).—The author points out that the method commonly employed of combining the chemical and the water in such a way as to make the solution slightly too strong and then adding water according to the results obtained by titrating against a standard, while productive of accurate solutions, involves considerable time. By weighing the chemical and the water, it has been found possible to make up solutions of NaOH and H_2SO_4 which, when titrated against a standard, have an accuracy of 1 part in 500. This method of preparing solutions is best carried out at a temperature of from 20° to 25° C., but reliable results can be obtained at slightly higher temperatures. Since the density of water at 20° is 0.998, it becomes necessary when weighing water to consider 998 as a liter.

A micro-Kjeldahl method including nitrates, R. H. MOORE. (P. R. Expt. Sta.). (*Bot. Gaz., 100 (1938), No. 1, pp. 250–252*).—For those finding it necessary to use a micromethod for determining total nitrogen in the presence of nitrates, a procedure is described which is adapted from the reduced iron macromethod of Pucher, Leavenworth, and Vickery[1] to the micromethod described by Pregl (E. S. R., 69, p. 170).

Modification of Eckerson method for determining nitrate reducase, A. D. HIBBARD. (Mo. Expt. Sta.). (*Plant Physiol., 11 (1936), No. 3, pp. 657, 658*).—It was found that, although the solutions used in the Eckerson method (E. S. R., 65, p. 829; 66, p. 828) were adjusted to the same pH at the beginning of the incubation period, there was an unequal decrease in pH, so that at the end of the period the extracts from different sources showed various degrees of acidity. Some of these extracts apparently contained a varying quantity of a natural buffer. The change in pH can be prevented by substituting 4 cc of 0.2 M phosphate buffer mixture (pH 7.3) for one-half of the water used in making up the original volume.

It was found that by removing colored substances with activated charcoal before treating with the sulfanilic acid reagent, a satisfactory comparison could be made. Upon being removed from the incubator the solutions were treated with 5 g of activated charcoal. After being thoroughly mixed and allowed to stand for 15 min. they were washed through a fine filter paper into 100-cc volumetric flasks. The flasks were made up to volume and 10-cc aliquots were used in the determinations. None of the nitrite was absorbed. A standard solution of nitrite treated in the same manner was not affected by the charcoal. For solutions which are difficult to clear with charcoal, a second clearing with 2 g of very fine magnesium oxide was found to be generally effective.

Report on hydrocyanic acid in plants, R. A. GREENE (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 3, pp. 354, 355*).—These qualitative tests and a method for quantitative determination, all of which have given satisfactory results in studies of cyanogenetic glucosides in Arizona range plants, are proposed for adoption as tentative methods of the A. O. A. C.

Acetals in the sugar group.—I, The dimethyl acetal of d-galactose, H. A. CAMPBELL and K. P. LINK. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 122 (1938), No. 3, pp. 635–640, fig. 1*).—The authors report upon the preparation of the penta-acetyl-*d*-galacto-dimethylacetal and of the *d*-galacto-dimethylacetal compounds which have not previously been obtained in a crystalline condition. The *d*-galacto-dimethylacetal hydrolyzes to the *α*-methyl-*d*-galactopyranoside under the conditions originally employed by E. Fischer for glycoside formation Polarimetric evidence indicates that when the *d*-galacto-acetal is hydrolyzed (at 25° [C.] in dry hydrochloric acid-methyl alcohol mixture) furanoside formation takes place first and subsequently the more stable pyranosides are formed. All compounds isolated were obtained in a crystalline condition, and the physical constants and analyses are reported.

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[1] Indus. and Engin. Chem., Analyt. Ed., 2 (1930), No. 2, pp. 191–193.

The adaptation of the ferricyanide maltose method to high diastatic flours, R. M. Sandstedt. (Univ. Nebr.). (*Cereal Chem., 14 (1937), No. 4, pp. 603, 604*).—Less than the usual 5 cc aliquot of flour extract must be taken if the maltose value is over 330. The use of these smaller aliquots has sometimes proved unsatisfactory for purposes demanding a high degree of accuracy. To overcome this difficulty, the ferricyanide method has been modified to use alkaline 0.1 N instead of alkaline 0.05 N ferricyanide. This modification permits the determination of maltose values up to 600 using 5 cc aliquots of flour extract. A new maltose conversion table is necessary and has been so made as to read maltose per 10 g of flour directly from the thiosulfate titration.

Effect of the enzymes of malted wheat flour upon certain properties of flour and dough, E. Munz and C. H. Bailey. (Minn. Expt. Sta.). (*Cereal Chem., 14 (1937), No. 4, pp. 445–457, figs. 8*).—Refractive index (n) of flour water infusions digested at 62° C. for 15 min. as a measure of diastatic activity was found to be highly correlated with the "maltose figure" or reducing sugar production. Progressive increments of malted wheat flour did not effect the same absolute or relative increase in either the maltose figure or refractive index (n_D) of the flours of low diastatic activity to which it was added. The first increment registered the largest increase in diastatic activity, and each successive increment was of smaller effect within the limits studied. Wheat malt prepared from different varieties and types of wheat varied considerably in its capacity to induce saccharogenesis when added to wheat flour of low diastatic activity.

"The degradation of dough plasticity or increase in mobility appears to be affected by α-amylase contributed by added malted wheat flour. β-Amylase registered a small or insignificant effect upon this property of doughs. α-Amylase as contributed by malted wheat flour resulted in a more substantial improvement in bread quality as registered in terms of loaf volume and bread 'scores' than the β-amylase of the malt flour."

The effects of protease increments on the plasticity of doughs, E. Rupp and C. H. Bailey. (Minn. Expt. Sta.). (*Cereal Chem., 14 (1937), No. 4, pp. 496–510, figs. 12*).—"The rate of decrease of development work (D. W.) of a flour is proportional to the concentration of papain added within certain limits. This rate was shown to vary from flour to flour, however. It was observed that a relationship existed between the amount of degradation produced by a definite increment of protease and the control D. W. of the flour. Hence, the rate of degradation can be related back to the D. W. of the flour. In the case of the papain preparation used it was found that the fractional rate of decrease of the value (D. W.—0.8) was the same for all flours."

The development work of a flour was changed by varying the mixing time in the preparation of a standard substrate and by varying the absorption, the temperature, and the pH. The data led to the conclusion that the procedure indicates a change in the activity of the enzyme regardless of the direct effect of these variables on the development work of the flour.

"The action of pepsin is not the same as that of papain, as shown by the fact that the comparative degradation produced on the gluten of one flour by the two enzymes did not necessarily have the same value when acting on the gluten of other flours. For pepsin it was found that with all flours the fractional rate of decrease of the value (D. W.+0.9) was the same."

The degradation produced when sprouted wheat flour was added to flour differed from that produced by relatively pure protease preparations. It appears that the α-amylase affects the physical properties of the dough sufficiently to mask the action of the proteases.

Oven spring of dough as influenced by sugar, salt, and yeast, W. O. Whitcomb. (Mont. Expt. Sta.). (*Cereal Chem., 13 (1936), No. 6, pp. 698–702*).—One flour produced a dough which had the greatest oven spring when no sugar was used, while four other flours gave doughs which had the greatest oven spring with 1 percent sugar. Abundance of sugar in dough at time of baking, as indicated by dark-brown color of top crust, was not reflected in high oven spring. With three flours at least 1 percent salt was needed in the dough for maximum oven spring, and with four other flours from 1.5 to 2 percent salt was required. Three flours produced doughs which had better oven spring when 1 percent yeast was used than with greater amounts, while three other flours produced doughs which gave the best oven spring with 5 percent yeast. Increased oven spring was observed with the doughs of three flours when 5 percent yeast was used even though the sugar had become exhausted at the time the dough was baked.

The present status of the "standard" A. A. C. C. baking test, M. J. Blish. (Univ. Nebr.). (*Cereal Chem., 13 (1936), No. 6, pp. 728–730*).—The author discusses the question whether the baking test should be an actual standard, definitely uniform in equipment and procedure, or merely an "Official" or approved type of procedure, not excluding some individual choice of equipment.

Determination of fat, moisture, and salt in hard cheese, G. H. Wilster, W. V. Price, A. J. Morris, E. F. Goss, and G. P. Sanders (*Jour. Dairy Sci., 20 (1937), No. 1, pp. 27–30*).—A sampling method slightly modified from that of the A. O. A. C., a fat determination based on the same principle as the Babcock cream test and carried out in a Babcock bottle, and both laboratory and factory methods for moisture determination are described, together with a method for determining salt from the total chloride percentage. The last-named procedure consists in adding excess of standardized silver nitrate solution to the cheese sample, destroying organic matter with nitric acid and potassium permanganate, and titrating the excess silver nitrate with thiocyanate, ferric ammonium sulfate as indicator.

Determination of egg quality by a sampling method, S. R. Hoover. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 3, pp. 496–502, figs. 3*).—The significance of an observed logarithmic relationship between the area of thick white and the "broken-out quality" of eggs is pointed out and the method of its determination simplified.

The evaluation of yellow mustard, A. Viehoever and W. L. Nelson (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 3, pp. 488–493*).—The authors made determinations which indicated that estimation of the percentage of sinalbin by direct isolation may serve as a method to evaluate yellow mustard.

Detection of fenugreek extract in artificial maple flavor, J. B. Wilson and G. L. Keenan. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 3, pp. 474–481*).—Choline reineckate may be quantitatively precipitated from products containing fenugreek extract under the conditions specified, and the crystals of the precipitated salt may be identified microscopically.

Preparing samples of canned dog food for proximate chemical analysis, C. J. Koehn. (Ala. Polytech. Inst.). (*Indus. and Engin. Chem., Analyt. Ed., 10 (1938), No. 6, pp. 325, 326*).—Large samples were used for moisture determination after a thorough mechanical mixing and then were ground and further mixed so that small samples could be made representative for the remaining determinations.

A new color reaction of vitamin B_1 (thiamin), H. W. Raybin (*Science, 88 (1938), No. 2271, p. 35*).—The author reports that vitamin B_1 reacts with 2,6-dibromoquinone-chloro-imide to give orange solutions of which the color is extractable by immiscible solvents such as chloroform. It appears that only the thiazole portion of the thiamine reacts to give the color with the reagent.

Effect of pressure on rate of gas production in yeast fermentation, R. M. Sandstedt and M. J. Blish. (Nebr. Expt. Sta.). (*Cereal Chem., 13 (1936), No. 6, pp. 789, 790, fig. 1*).—The authors find that pressures in excess of that of the atmosphere up to several hundred millimeters have no appreciable effect on fermentation rates. When dough fermentation was carried out under manometric measurement of gas production, for so long that it became necessary to release the pressure several times during the process in order to prevent the mercury from being blown out through the top of the manometer, and the total accumulated pressure values were plotted against time, it was invariably found that a sudden release of pressure failed to produce any perceptible break in the continuity and slope of the curve.

Bacteria and enzymes and their relation to food preservation at low temperatures, M. A. Farrell. (Pa. State Col.). (*Canner, 87 (1938), No. 5, p. 28*).—This note points out that few, if any, micro-organisms multiply at or below —10° C.

Quality control vital to success in frozen foods industry, D. K. Tressler. (N. Y. State Expt. Sta.). (*Food Indus., 10 (1938), No. 6, pp. 320–323, 357–359, figs. 4; also in Fruit Prod. Jour. and Amer. Vinegar Indus., 17 (1938), No. 12, pp. 363–367*).—The author points out that success in the frozen foods business depends upon placing in the consumer's hands a product of quality equal to or better than the average for first-class fresh foods. This can only be accomplished by means of adequate control which starts with the selection of the variety that is to be frozen and extends through all the steps of raw material production to retailing. This article deals with the establishment and maintenance of such control with specific reference to fish, meat, fruit, poultry, and vegetables.

Frozen fruits and vegetables, D. K. Tressler. (N. Y. State Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16 (1937), No. 5, pp. 133–135, 153*).—This is a discussion of the advantages and probable future of the freezing preservation of foods.

The utilization of surplus fruits, W. V. Cruess. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1936), Nos. 9, pp. 264, 265, 280; 10, pp. 296–301, fig. 1*).—The author points out numerous food, juice beverage, and fermented beverage uses to which surplus fruit may be more profitably put than to that of power alcohol production.

The chemist looks at the citrus products industry in Florida, H. W. von Loesecke. (U. S. D. A.). (*Citrus Indus., 19 (1938), No. 6, pp. 6, 7, 19*).—The author discusses the direct products and byproducts of the citrus industry from the viewpoint of present and potential uses and markets and possible development of new products and outlets.

Buffering action of nonacid vegetables, G. L. Marsh (*Hilgardia [California Sta.], 11 (1938), No. 7, pp. 315–341, figs. 8*).—"The buffer capacity of the expressed juices of the vegetables tested was affected to only a slight extent by heat when the juices were heated in contact with acid, but marked changes occurred when the juices were heated in contact with base. Heating prior to the addition of acid causes a marked change in the buffer capacity of pea juice as determined by potentiometric titration with base." Peas and artichokes had the highest buffer indexes of the various vegetables tested, followed in order by green asparagus, string beans, and white asparagus. Acidified brines increased markedly in pH value during canning with nonacid vegetables. The change in pH value was less with acetic acid brines than with citric acid brines of the same low initial total acid concentration. With brines of the same initial pH value, markedly less change occurs in citric acid brines than in acetic acid brines. Peas exerted a greater buffering effect on acidified brines than any of the other vegetables tested. A definite loss of acid occurred when vegetables were canned with acidified brines, "which accounts for a part, at least, of the increase in pH values noted. Probably the acid lost is involved in adsorption reactions with the colloidal systems of the vegetable tissues. The total buffer effect noted, however, cannot be ascribed to any single substance or system but is complex in nature."

Dried Italian prune products, E. H. Wiegand and K. P. Fenner (*Oregon Sta. Bul. 353 (1938), pp. 25, figs. 15*).—Byproducts and new markets offer means of disposing of excesses of fresh and of dried prunes. When canned, the dried fruit requires less home preparation than the product sold in the dried condition. Partial refreshing before canning was found desirable. Small or offgrade fruit could be made into dried prune beverages in several ways. A satisfactory pitting machine offers the possibility of saving in freight costs. Dried prune pulp may be used in soda fountain, ice cream, and bakery products, and may be made from small or poorly shaped fruit. The development of a machine for halving and pitting before drying permitted shortening drying periods and lower drying temperature and so yielded a product more like the fresh fruit. Consumer trials indicated a favorable response to the last named product.

Winery tank coatings, W. V. Cruess. (Univ. Calif.). (*Wine Rev., 6 (1938), No. 2, pp. 16, 17, 34*).—The author reports upon tests of various coatings for cement concrete wine tanks. Various paints, lacquers, etc., were tried, many of which imparted strong odor or taste or both to the stored wine. While coatings composed of equal proportions of gilsonite and paraffin were firmer and somewhat more impervious than those consisting of from 75 to 25 percent of paraffin, the latter were much less difficult to apply since their melting point is sufficiently low to permit normal use of a paint brush. Judged by the amount of calcium increase in the wine, the gilsonite-paraffin mixtures were superior to the other coatings.

Gilsonite is a brittle, naturally occurring black asphalt. It is practically tasteless and odorless. It may be heated to a high temperature to expel the small amount of remaining volatile, odoriferous compounds before use if desired.

AGRICULTURAL METEOROLOGY

[Abstracts of papers presented at the Washington meeting of the American Meteorological Society, April 1938] (*Bul. Amer. Met. Soc., 19 (1938), No. 6, pp. 263–265*).—The following are included: A Comparison Between the Records of Dines and Robinson Anemometers, by W. A. Mattice; Some Observations on Factors Affecting the Measurement of Solar Radiation by Pyrheliometers, by L. F. Miller; and A New Electrical Raingage, by W. E. Knowles.

Monthly Weather Review, [July–August 1938] (*U. S. Mo. Weather Rev., 66 (1938), Nos. 7, pp. 205–234, pls. 8, figs. 11; 8, pp. 235–261, pls. 9, figs. 6*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 7.—Some Meteorological Aspects of Nebraska Tornadoes, by H. Lemons (pp. 205–208); A Periodogram Investigation of Short-Period Sunspot Cycles, by D. Alter (pp. 208–212); and Analyses of Rains and Snows at Mount Vernon, Iowa, 1937–38, by N. Knight (p. 213).

No. 8.—The Unusual Windstorm of February 9, 1938, at San Francisco, by T. R. Reed (pp. 235–237); A Comparison Between Wind Velocities as Recorded by the Dines and Robinson Anemometers, by W. A. Mattice (pp. 238–240); and Tropical Disturbances of August 1938, by I. R. Tannehill (pp. 240, 241).

The determination of the meteorological conditions of the atmosphere by the use of radio-sounding balloons, H. A. THOMAS (*Roy. Soc. [London], Proc., Ser. A, 167 (1938), No. 929, pp. 227–250, figs. 11*).—Previous methods of atmospheric exploration by radio-sounding balloons are reviewed, and it is explained that arrangements involving radio frequency variations are unlikely to be satisfactory due to the wide frequency band required and the possibility of appreciable interference. In the original method described, a signal of fixed radio frequency is employed, and each meteorological instrument produces a continuous variation of modulation frequency. The pressure- and temperature-measuring instruments are arranged to produce variation of modulation frequency without mechanical linkages. The cost of the apparatus is said to be comparatively low, and reproduction in large quantities possible. The results from a number of experimental ascents are analyzed as showing great reliability and accuracy. Observation of pressure and temperature up to ±10 km altitude is obtained, the accuracy of these determinations being ±5 mb and 1° C., respectively.

Investigations of the morphology of air pressure curves [trans. title], K. STUMPFF (*Met. Ztschr. [Braunschweig], 55 (1938), No. 7, pp. 237–250, figs. 8*).—An analytical discussion with presentation of formulas and curves.

A theoretical note on the diurnal variation of wind-vector due to the variation of eddy viscosity, T. NAMEKAWA and T. TAKAHASI (*Mem. Col. Sci., Kyoto Imp. Univ., Ser. A, 21 (1938), No. 1, pp. 31–33, figs. 2*).—The authors present a study of the diurnal variation of wind vector caused by the variation of eddy viscosity and put forward a hydrodynamic theory (formulas given) which may explain some of the chief diurnal characters of wind direction as well as speed.

Investigation of spectral measurements of the radiation properties of snow and ice with photo-elements [trans. title], F. SAUBERER (*Met. Ztschr. [Braunschweig], 55 (1938), No. 7, pp. 250–255*).—The author presents the results of a study of the reflection and absorption powers of snow and ice as determined by photoelectric elements and light filters.

An electric hygrometer and its application to radio-meteorography, F. W. DUNMORE (*Bul. Amer. Met. Soc., 19 (1938), No. 6, pp. 225–243, pl. 1, figs. 15*).—It is concluded from this paper, which is in the nature of a progress report, that the electrical hygrometer appears to offer a new tool for the measurement of humidity in the upper atmosphere. Further flight tests, elimination of the aging effect, and development of means for calibrating this type of device at low temperatures seem to be all that now is necessary to adapt it to routine measurements in the upper air.

Determination of thermal conditions in phytoclimatology [trans. title], L. CHAPTAL (*Ann. École Natl. Agr. Montpellier, n. ser., 25 (1938), No. 1, pp. 57–73*).—The author discusses the effects of hot and freezing temperatures on plants, the determination of environal temperature conditions as related to phytoclimatology, the results of observations made with the katathermometer, and the question of actinothermic indexes.

New experimental studies on the dispersive effect of frost on clay suspensions [trans. title], J. Ruess (*Bodenk. u. Pflanzenernähr., 8 (1938), No. 3–4, pp. 152–182, figs. 4*).—That a favorable influence of frost on heavy soils exists is well known, and previous work has demonstrated two possible types of action, viz, a flocculative and a dispersive effect of the frost on the particles. Since viscosity is a complex phenomenon, particle counts as well as turbidity and conductivity measurements were introduced into this study. With respect to viscosity, clay suspensions behaved like solutions of electrolytes. The dispersive effect of frost did not become apparent immediately, but rather it was at first masked by a flocculation more or less removable by a 3-hr. agitation. A dispersive effect of frost was to be observed in all suspensions and under different rates of freezing after a breaking up of the floccules. The degree of dispersal was influenced by the number of freezings and by the nature of the original material. The influence of hydration on dispersal by frost was but slight. The viscosities of the unfrozen suspensions saturated with different cations varied according to the degree of hydration. The stronger the hydration of the sorption cations the greater was the viscosity.

On the origin of tropical cyclones, with an analysis of the Caribbean cyclones of 1935–36, E. Scofield (*Bul. Amer. Met. Soc., 19 (1938), No. 6, pp. 244–256, figs. 5*).—According to the data and theories set forth in this study, it is concluded that two factors are of significance in forecasting the development of tropical storms: (1) The formation of a "Dreimasseneck" and (2) the "rolling back" of the Ts (tropical superior) inversion. Neither of these phenomena alone may result in the development of a tropical cyclone of storm intensity. The close approach or intersection of the tropical and polar fronts always results in the development or intensification of frontal waves along the portions of the fronts near the area of falling pressure. In order for a hurricane to develop from such a wave disturbance, however, the Ts inversion must apparently be destroyed.

Flood and hurricane damage to crops in New England (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 22 (1938), No. 19, p. 390*).—A preliminary survey of losses to tobacco, onion, potato, and apple crops and of damage to fruit trees.

Weather conditions in 1936 as they affected the fruit grower, E. M. Stoddard. (Conn. [New Haven] Expt. Sta.). (*Conn. Pomol. Soc. Proc., 46 (1936), pp. 169, 170*).—A brief summary.

Weather and crop history in western Canada, E. C. Hope (*C. S. T. A. Rev. [Canada], No. 16 (1938), pp. 347–358, figs. 2*).—From the data presented there appear to have been two definite, long periods of drought in western Canada, viz, 1885–96 and 1929–37, with a possible third from 1838 to 1848. Between 1862 and 1868 there were four very dry years in Manitoba, and from 1917 to 1921 there was a dry period over most of western Canada. The period of the 70's and early 80's was probably the wettest period in western Canada for over a century. Serious grasshopper outbreaks occurred in 1818–20, 1857–58, 1864–68, 1874–75, 1920–22, and 1931–37. A tabulated chronological summary of weather and crop history in this section is presented (1813–1937).

Climate and soil in the Netherlands Indies, E. C. J. Mohr (*Bul. Colon. Inst. Amsterdam, 1 (1938), No. 4, pp. 241–251*).—The author discusses the points in which the Netherlands Indies differ intrinsically from both Europe and the United States, viz, in climate and soil. Particular emphasis is laid on the fact that though rain may be a blessing to an agricultural area parched from drought, it is equally true that in the tropical zone in which this region is situated too much rain may be injurious, and that, in fact, the abundant rainfall there is the cause of a continually increasing impoverishment of the soil. Without human intervention in this area the only regeneration of the soil leading to radical improvement is said to be through volcanic action.

SOILS—FERTILIZERS

[Soil investigations, Utah Station] (*Utah Sta. Bul. 282 (1938), pp. 27–32, 70, 71, 72–75, fig. 1*).—Results are noted from fertilizer and rotation tests, soil surveys (coop. U. S. D. A.), alkali and other technical soil studies, chemical analyses, nitrate supply and utilization, *Azotobacter* content of Utah soils, effect of legumes and other crops on nitric nitrogen, maintenance of soil nitrogen, effect of water on bacteria of soil, and soluble salt and bacterial activity.

The physiography of Arizona valleys and the occurrence of groundwater, G. E. P. Smith (*Arizona Sta. Tech. Bul. 77 (1938), pp. 41–91, pls. 3, figs. 26*).—This bulletin describes the physiography of Arizona valleys, including the natural surface features and the character and origin of the underlying valley fill; indicates the location, storage characteristics, and availability of the ground-water supplies in general; and shows the relationship of the physiography to the important supplies.

"Although the topography of the bottom lands, the slopes, and the foothills appears to be accidental and haphazard, it is found on analysis to be definitely regular and understandable. Based on a knowledge of the origin and history of the natural surface features, a great deal can be foretold about the water storage capacity and the safe yield of the underlying formations."

The importance, in relation to the Arizona ground-water law, of a distinction between "percolating" waters and waters "flowing in definite underground channels" is noted, and the basis for such a distinction is provided.

On the formation of structure in soil.—IV, The structure of mixed clay-sand and clay-humus formations. V, Granular structure, D. I. Sideri (*Soil Sci., 46 (1938), Nos. 2, pp. 129–137, pl. 1; 3, pp. 267–271, pl. 1*).—In the fourth paper of the series (E. S. R., 77, p. 305) the author describes clay-sand and clay-humus formations which show that clay is the structure-forming component of soil.

"Admixtures of iron and aluminum oxides to clay hinder the aggregation of clay particles. The presence of oxides in large amounts destroys the orienting properties of clay in respect to humus. In this case, mere coagulation occurs with a confused distribution of particles. The elimination of iron and aluminum oxides from the surface of clay particles increases the ability of these particles to aggregate. A particular 'rod' structure arises, the rods being optically homogeneous and possessing positive double refraction."

In paper 5 the author bases an interpretation of the form of the structural elements of Chernozem soils on the study of the decomposition of the complex mixed sand-clay-humus formations. He finds that the form of the typical granular structure of Chernozem is a sign of the accumulation of amorphous humus at the periphery of the aggregate. The humus supply, by itself, does not insure a stable granular structure. A necessary condition for the formation of stable aggregates is the formation of a metastable envelope of oriented substance at the surface of the amorphous humus layer, which preserves the microaggregate from division.

"Increase of the exchange capacity of soil must be closely connected with the appearance of amorphous humus at the periphery of the aggregate. If organic matter is firmly bound with clay as an anisotropic formation, no marked increase in the adsorption capacity occurs."

The laterites of western Samoa, F. T. Seelye, L. I. Grange, and L. H. Davis (*Soil Sci., 46 (1938), No. 1, pp. 23–31*).—The authors find that in Samoa the lateritic process has gone far without segregation of iron oxide and alumina; that the lateritic process is going on in a young soil which still retains most of its lime and magnesia; that most of the soils losing silica are only slightly acid or are neutral, although a very acid soil also is losing silica; that in the most extreme stage the soils are as low in silica as are many of the laterites of India; and that although some soils contain virtually only alumina, iron oxide, and titania, they are still capable of producing profitable crops for many years without fertilizers, and all the soils have a surprisingly high content of total nitrogen.

"The younger soils contain red coloring, and older soils, although well drained, take on a dark brownish-yellow color. Silica-sesquioxide ratios of the clay fractions remain constant for a fairly long period in the process—as far as the Vaitele stage. In the well-leached soils the ratio drops extremely low. To a depth of 5 ft. in the profile no marked difference occurs in total constituents or in the composition of the clay fractions."

Laterite soils derived from basalt are found to be difficult to classify on the basis of field characteristics. All the usual chemical analyses can be utilized to assist, but the determination of total silica is thought to offer the most reliable and quickest aid.

Ferromanganiferous concretions from some podzolic soils, E. Winters. (Univ. Ill.). (*Soil Sci., 46 (1938), No. 1, pp. 33–40*).—The concretions examined were irregularly spherical, dark brown, moderately hard bodies that varied in size from 10 mm to less than 0.05 mm. They become magnetic after gentle ignition. Such concretions were usually found to be most abundant in the surface horizons of poorly drained, light-colored soils, though a few small ones were present in virtually all horizons of nearly every soil type. They were found to be much higher in manganese and iron, slightly higher in aluminum, and lower in silicon dioxide and organic matter than were the soils in which they occurred. Large concretions were found to be higher in manganese than were small ones.

Infiltration capacity of some Illinois soils, R. S. Stauffer. (Ill. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 6, pp. 493–500, figs. 4*).—The infiltration capacities of several Illinois soils were determined at 14 locations. The results indicate that at 3 locations the soils have high infiltration capacities and at 11 low infiltration capacities. Of a number of factors which may cause the infiltration capacities of soils to vary, the dominant factor seems to be the physical character and condition of the soils themselves.

Mississippi soil types and their preferences, S. W. Davis. (Miss. State Col.). (*Better Crops With Plant Food, 22 (1938), No. 4, pp. 10–12, 36–38, fig. 1*).—Most of the types tested showed some need for additional potassium in the fertilizer, the profit being considerably increased on some of the soils so treated. Others gave slightly less yields of some crops when the fertilizer was changed from 600 lb. per acre of 4–8–4 to the same quantity of 4–8–8.

Soil survey of Monroe County, New York, A. T. Sweet et al. (Coop. [N. Y.] Cornell Expt. Sta.). (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1933, No. 17, pp. 67, pls. 2, figs. 2, maps 3*).

Soil survey of Adams County, Ohio, A. E. Taylor et al. (Coop. Ohio Expt. Sta.). (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1932, No. 29, pp. 64, figs. 2, map 1*).

The edaphological classification (soil survey) of the soils of Puerto Rico and its agricultural importance [trans. title], J. A. Bonnet (*Rev. Agr.*

Puerto Rico, 28 (1936), No. 1, pp. 95–98).—The author notes that the completion, in July 1936, of its soil survey made Puerto Rico the one country in the world to have completed such a survey of all its lands. The work required 8 yr. He further points out, however, that the completion and publication of the soil survey should not be looked upon as a panacea which can solve all the agricultural problems of the country but rather as a necessary basis for researches related to the scientific and economic progress of the country's agriculture.

An efficient and convenient type of cooling and freezing bath, G. J. Bouyoucos. (Mich. Expt. Sta.). (*Soil Sci., 46 (1938), No. 1, pp. 21, 22, fig. 1*).—The author points out various practical disadvantages of the type of insulating vessel consisting of a small earthenware jar packed in asbestos fiber in a larger jar with a paraffin seal on the top of the annular space. To avoid the difficulties encountered in the use of this equipment, the author packed a 12-qt. pail in rockwool in a metal bushel basket, joining the pail and the basket by means of an annular sheet metal lid which is brazed to both pail and basket to afford a permanent airtight and watertight seal for the insulating space. The inside of the pail is painted to prevent rusting, and is provided with a rubber-felt pad in the bottom to cushion the dilatometer. The top cover is also of rubber-felt, perforated to permit the protrusion of the upper part of the apparatus to be cooled. The device has been found to keep ice for from 3 to 4 days, a constant temperature being maintained with only an occasional stirring.

Results of lysimeter experiments, A. Demolon and E. Bastisse (*Soil Sci., 46 (1938), No. 1, pp. 1–7*).—Lysimeter work of the usual type is reported upon together with a like experiment carried out over a period of 5 yr. on the weathering of finely crushed granite rock. The composition of the leachings and the quantity and nature of the colloids produced were studied. From 800 kg of crushed rock, 6.48 kg of clay were formed. The total of substances dissolved out by the leaching waters collected amounted to 387.3 g of dry matter.

"From a physicochemical point of view our juvenile clay displays every property common to clay colloids. Particularly, it behaves as a hydrophilic suspensoid and is sensitive to coagulating agents. The fixation capacity of bases is very similar to that of older clays, chiefly of the finest fraction. This experiment gives us a view of the first stage of clay genesis in the weathering of granite under our climatic conditions [at Versailles, France]. It shows that in a roughly comminuted mass, clay colloids are formed very early by a hydration process which preserves an important part of the combined bases."

A field outfit for determining the moisture content of soils, G. J. Bouyoucos. (Mich. Expt. Sta.). (*Soil Sci., 46 (1938), No. 2, pp. 107–111, pl. 1*).—The author has arranged the apparatus necessary for the burning-alcohol method for estimating soil moisture (E. S. R., 78, p. 588) in a portable light galvanized iron casing of convenient dimensions in which the balance is protected from draft to permit its accurate use in the field.

The movement of water in heavy soils after irrigation, E. C. Childs (*Soil Sci., 46 (1938), No. 2, pp. 95–105, figs. 5*).—Reasoning from the assumption that the rate of flow of soil moisture at a given point in a given direction is proportional to the gradient of the moisture profile in that direction, the author has developed a mathematical expression of the theory of the process of diffusion of water in heavy soils and has compared the theoretical with the observed results under the conditions of irrigation. It is shown that diffusion can account for the slow movements after irrigation and can be important in soil amelioration, but that during flooding such movements are masked by the more rapid gravitational movement.

A theory explaining the relation of soil-water ratios to pH values, C. M. Keaton. (Wash. Expt. Sta.). (*Soil Sci., 46 (1938), No. 3, pp. 259–265*).—The author found that in the determination of the pH values of several soils at different soil: water ratios, ranging from a ratio of 1:10 to approximately normal moisture capacity, the condition under which the soil reaction is determined by the use of a glass electrode has a pronounced influence on the pH value obtained. He also shows that in acid soils the minimum pH value occurs when the soil: water ratio is at the point of the water-holding capacity of the soil. A further reduction in the soil moisture content results in increased pH values because the proportion of metallic cations to H ions is low enough to produce a counteraction of the Debye-Hückel activity effect by the effect of preferential dissociation. In the more alkaline soils, the proportion of metallic cations is much higher than that in acid soils. Therefore, the "activity effect" overshadows the effect of preferential dissociation, with the result that a continued decrease in pH values takes place with decreasing moisture content.

Isohydric pH value of soils and its determination, Amar Nath Puri and A. Sarup (*Soil Sci., 46 (1938), No. 1, pp. 49–56, figs. 2*).—Isohydric pH value of a soil is defined as the pH value of a buffer solution at which it shows no change in reaction on contact with the soil and which brings about no change in the base content of the soil. A method of determining isohydric pH value, titration curve, buffer capacity, and lime requirement of soils is described.

Hydrogen-ion activity of colloidal acids in soils, A. N. Puri and A. N. Dua (*Soil Sci., 46 (1938), No. 2, pp. 113–128, figs. 7*).—The authors removed all exchangeable bases from soils by exhausting them with 0.05 N hydrochloric acid, washed out all free soluble acid with water, and then determined the capacity of the colloidal acids or soil acidoids to hydrolyze ethyl acetate and sucrose, studying these processes in detail as means of ascertaining the H-ion activity of the soil acidoids. The behavior of the acidoids in catalyzing the hydrolysis reactions was analogous to that of soluble acids.

Influence of salts and soil-water ratio on pH value of soils, A. N. Puri and A. G. Asghar (*Soil Sci., 46 (1938), No. 3, pp. 249–257, fig. 1*).—The authors point out that inasmuch as the pH value of soil is due to the surface ionization of the colloidal particles and hydrolysis of the exchangeable base, it is to be expected that the presence of a salt (common ion) would reduce hydrolysis and result in a lowering of the pH value, and that, on the other hand, since the ionization is confined to the surface, mere dilution in the absence of salts may have no marked effect on the pH value of the suspension as a whole. They present experimental evidence confirming this view and showing that salts have a marked influence on soil reaction, which alters appreciably in the presence of even small quantities of neutral salts. The authors also show that the effect of soil: water ratio on soil reaction is indirect insofar as the soil water alters the concentration of salts present, and that in the absence of salts the pH value is not affected by soil: water ratio. They conclude that since natural soils contain varying amounts of salts, uniformity of results can only be obtained by determining soil reaction in N potassium chloride solution.

Cation equilibria in plants in relation to the soil, T. B. Van Itallie (*Soil Sci., 46 (1938), No. 3, pp. 175–186, figs. 7*).—Using a soil very low in replaceable base content, the author studied, at the State Agricultural Experiment Station, Groningen, Netherlands, the effect upon plant cation content of large changes in the proportions of added calcium, magnesium, potassium, and sodium. In the resultant replacement of cations in the plant, the absorption and replacement were greatest in the case of potassium; the values decreasing progressively for sodium, magnesium, and calcium.

"In consequence of this different replacement capacity of the four cations, one finds no satisfactory relationship between the concentration of an ion in the soil and that in the plant, even when concentration in the soil is expressed in percentage figures. By giving, however, to the concentration figure of each cation in the soil a special coefficient, and taking the ratio of the soluble plus exchangeable amount of each ion and the same amount of the others, we obtained soil values which gave a satisfactory correlation with the composition of the plants."

Some aspects of the chemistry of soil colloids, L. A. DEAN (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *42* (*1938*), *No. 3, pp. 163–166*).—This brief discussion indicates the general nature of the soil colloids, their ultimately crystalline structure, and the chemical character of the base exchange reaction.

Capillary conductivity of peat soils at different capillary tensions, B. D. WILSON and S. J. RICHARDS. (Cornell Univ.). (*Jour. Amer. Soc. Agron.*, *30* (*1938*), *No. 7, pp. 583–588, fig. 1*).—The authors investigated the capillary conductivity of water in four peat soils at varying capillary tensions. The conductivities of the soils were found to decrease rapidly and continuously with increasing values for capillary tension. An increase in the capillary conductivity of peat soil seemed to result from prolonged cultivation owing to a type of structure resulting from cultural practices. The conductivity of peat soil was found to be extremely low in the presence of relatively large amounts of moisture.

Microbial activities in soil.—IV, Microflora of different zonal soil types developed under similar climatic conditions. V, Microbial activity and organic matter transformation in Palouse and Helmer soils, S. C. VANDECAVEYE and H. KATZNELSON. (Wash. Expt. Sta.). (*Soil Sci.*, *46* (*1938*), *Nos. 1, pp. 57–74, figs. 4; 2, pp. 139–167, figs. 9*).—The fourth and fifth papers of this series (E. S. R., 79, p. 590) report upon an investigation in which untilled silt loams of the Helmer and Palouse series were studied in detail with respect to microflora, chemical nature of the organic matter, and changes induced by various treatments. It was concluded, in part, that "where the reaction of the two types of soil formed is only slightly acid and varies but little, as in the Palouse and the Helmer soils, the bacteria, though numerous in the soil material from the beginning, will be stimulated more by the organic residues of higher base content than by those of lower base content. The particular type and activity of the soil microflora thus established, chiefly through the nature of the plant residues that are supplied, play an important role in the development of specific inherent soil properties during the course of soil formation. Thus, the kind of vegetation and, hence, the quantity and nature of the organic residues added to identical soil materials exposed to similar climatic conditions will result in the production of different amounts of humus and in the development of diverse types of microflora, which, in turn, will produce dissimilar organic decomposition products and types of humus. The influence of these factors is paramount in the differentiation of such inherent soil characteristics as humus content, reaction, color, and structure."

Some effects of carbon dioxide on the decomposition of organic matter and the accumulation of nitrates in the soil, F. B. SMITH, P. E. BROWN, and H. C. MILLAR. (Iowa Expt. Sta.). (*Soil Sci.*, *43* (*1937*), *No. 1, pp. 15–25, pl. 1, figs. 4*).—The authors treated soils containing decomposing straw and check samples with carbon dioxide gas and a water solution of carbon dioxide. They also aerated with a 1:4 mixture of pure oxygen with pure nitrogen to determine the effect of an artificially lowered carbon dioxide content.

The accumulation of carbon dioxide in the soil depressed the initial rate of decomposition of organic matter in the soils to which straw was added. This depressing effect was evident 4 mo. after the addition of the straw. The depressing effect of carbon dioxide on the rate of decomposition of organic matter was not so pronounced in the untreated soils as in the soils treated with straw. It is believed that there were fewer and less active organisms and species differences in the untreated soils than in the straw-treated soils, and the depressing effect of the carbon dioxide in the straw-treated soils resulted from an oxygen deficiency at a time when optimum aeration was required for rapid decomposition. The treatment with carbonic acid was effective in stimulating nitrate production, but the treatment with carbon dioxide gas was without significant effect. The stimulation of nitrate production by the carbonic acid is considered to have been related to the increased solubility of the mineral constituents required by the nitrifying organisms. The failure of carbon dioxide gas to affect the nitrate content of this soil indicates that carbon dioxide was not a limiting factor in nitrification. The stimulation of nitrification by aeration with nitrogen and oxygen was taken to indicate that perhaps the concentrations of carbon dioxide attained in the soils so treated may have been sufficiently high to create an oxygen deficiency.

Nitrate production in soils as influenced by cropping and soil treatments, W. A. Albrecht (*Missouri Sta. Res. Bul. 294* (*1938*), *pp. 22, figs. 14*).—Soil from corn grown continuously had the lowest nitrate-producing capacity. Soils from continuous wheat and from oats were of equal capacity but slightly higher than that from corn. Soil from timothy was above that from these two cereal grains. Soils from under crop rotations had greater capacities for producing nitrates as the rotations were shorter. Since clover occurred only once in each of 3-, 4-, or 6-yr. rotations, this suggests that this improved nitrate delivery in the shorter rotation may be due to the more numerous crops of clover to make their greater additions of nitrogenous matter to the soil.

Soil treatments were of greater significance in causing improved nitrate accumulation. Phosphates and limestone were most effective. "Their addition would then hasten depletion of the soil nitrogen through its conversion into the soluble form." The addition of nitrogenous fertilizers, mixed fertilizers, and manure were all effective in improving nitrate accumulation in the laboratory studies. Soils which had had these nitrogenous materials as field treatments had a better capacity to deliver soluble nitrogen when under test.

"These facts point forcibly to the need for supplying the soil with nitrogen to be nitrified, and . . . also with the minerals as essentials in the functioning of the micro-organisms that convert the nitrogen into the available form."

An evaluation of the Neubauer and the Cunninghamella and Aspergillus niger methods for the determination of the fertilizer needs of a soil, C. A. Mooers. (Tenn. and Wis. Expt. Stas. et al.). (*Soil Sci., 46* (*1938*), *No. 3, pp. 211–227, figs. 2*).—Both the Neubauer method (E. S. R., 53, p. 319) and the fungus (*Cunninghamella*) method (E. S. R., 72, p. 745) made positive distinctions between fertilized and unfertilized plats on the same kind of soil. The comparative rating of various soil types by the two methods was, in the majority of cases, in general agreement with the known condition of the soils. However, "the evidence was considered conclusive that different soils might require materially different standards of interpretation," and, although there was a general agreement in the data obtained by the two methods when a number of samples could be averaged, there was frequent and wide disagreement in individual samples. It was concluded that the Neubauer method for both phosphate and potassium is liable to serious error in individual samples and that the fungus methods are far superior in this respect because of their low inherent source of error. When the two methods were compared as means of obtaining an index of the availability of different phosphates for each of five types of soil, neither method gave results for calcium metaphosphates in harmony with the data from field experiments. The ranking of the other phosphates by the two methods was in wide disagreement, but that indicated by the *Cunninghamella* method was in close harmony with the field results.

A comparison of Mitscherlich trials on Hawaiian soils in Germany and in the Territory of Hawaii, O. C. Magistad (*Jour. Amer. Soc. Agron., 30 (1938), No. 8, pp. 692–698, figs. 3*).—In general, Mitscherlich pot tests at both places showed the soils to be low in available nitrogen and phosphates, while almost all soils were well supplied with available potassium. The tests in Hawaii indicated that the natural store, or b value, for nitrogen and phosphates was far greater than found in Germany. This may be explained by the much longer growing period in Hawaii and possibly by the greater rate of nutrient liberation at the higher Honolulu temperatures.

The comparison clearly shows that the indicator crop in this method of soil testing must be selected with particular reference to the locality involved.

A modern conception of soils, fertilizer action, and plant nutrition, E. Truog. (Univ. Wis.). (*Natl. Fert. Assoc. Proc., 14 (1938), pp. 66–78; also in Com. Fert., 57 (1938), No. 3, pp. 22–30*).—This is a historical sketch of the growth of practical soil and plant-food knowledge from about 160 yr. ago to the present time. The topics considered are the rise of chemistry, soil recognized as a distinct natural body or entity, soil is a three-phase system, base-exchange material is a storehouse, iron oxide and other compounds, soil testing, proper interpretation of soil tests, and the minor nutrient elements.

Public and private aspects of soil conservation, G. S. Wehrwein. (*Univ.* Wis.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 447–452*).—The author notes, in part, that the 4 million acres reported to have become devastated by erosion in 1910 have since increased to 51 million acres, and that "part of the failure of the first conservation crusade was due to the overemphasis and distortion of facts. The public soon discovered that coal would not be gone in 50 yr. or a century and became blase and refused to listen any further. The other reason is that little thought was given to the practical problem of carrying through a program within the framework of our institutions, legal, economic, and political." The present paper calls attention to this phase of the problem.

Bibliography on soil erosion and soil and water conservation, S. H. Gaines, F. Vincent, M. Bloom, and J. F. Carter (*U. S. Dept. Agr., Misc. Pub. 312 (1938), pp. V+651*).—This work is a group of separate bibliographies on erosion and conservation in general; bibliographies; climate and physiography as related to soil erosion; drought; economic and farm management phases of soil conservation; educational phases of soil conservation; engineering in erosion control; flood control and related subjects; forest cover in soil and water conservation; gullies; land-use planning and surveys for soil and water conservation; legislation; pasture and range management; run-off and soil loss; soil structure, fertility, and moisture studies; stream flow, sedimentation, and related subjects; vegetative and tillage control in general; wildlife management as related to soil conservation; wind erosion, windbreaks, and shelterbelts; and wood lots. These bibliographies are preceded by a list of citations by geographic regions and are followed by an author index. Excepting the brief bibliography of bibliographies (pp. 165, 166), the citations given in the bibliographies here assembled are accompanied by brief abstracts of the publications cited.

Soil defense in the Northeast, G. K. Rule (*U. S. Dept. Agr., Farmers' Bul. 1810 (1938), pp. 70, figs. 42*).—The region dealt with includes the New England States, New York, Pennsylvania, New Jersey, Delaware, and the eastern half of Ohio and extends southward through West Virginia and Maryland. In these Northeastern States the conspicuous and complete destruction of land by gullying is not common, but the author warns against widespread sheet erosion which is impairing the natural productive capacity of the soil. The best known procedures for stopping the loss of the remaining topsoil are outlined, with an explanation of the measures that are now being taken by the Soil Conservation Service in cooperation with the farmer in six areas.

"Topsoil could be preserved in the Northeast, as elsewhere, if all of the land susceptible to erosion were restored to nature's protective mantle of vegetation. Yet men must get their food from the land, and the obvious and sensible policy is to safeguard all areas with the best known and most appropriate devices to hold soil while deriving a living from it."

Soil defense in the South, E. M. Rowalt (*U. S. Dept. Agr., Farmers' Bul. 1809 (1938), pp. [4]+64, figs. 39*).—This describes farming practices that conserve soil and indicates how such practices may be applied in that part of the Cotton Belt extending west from the Georgia-Alabama line to central Texas and southern Oklahoma (E. S. R., 76, p. 858). It is based largely on the soil conservation practices employed by farmers within the various project areas of the Soil Conservation Service in this section of the cotton country.

To hold this soil, R. Lord (*U. S. Dept. Agr., Misc. Pub. 321 (1938), pp. [6]+122, pls. 39, fig. 1*).—This is a broad, generally nontechnical treatment of the history, the effects to the present time, and the measures now being taken to control accelerated erosion as caused by water and wind.

Soil and field-crop management for southwestern New York, A. F. Gustafson (*[New York] Cornell Sta. Bul. 703 (1938), pp. 47, figs. 16*).—Because of the time necessary for the preparation of bulletins of this type for each county, it has been decided to take up the soils of the State in six general soil areas, namely, northern, Lake region, southwestern, Catskill, southeastern, and Long Island.

The southwestern area, here dealt with, consists of the Appalachian Plateau and its northern border in the western and southern parts of the State, and lies at elevations ranging from below 800 to more than 2,000 ft. With the exception of an area in southern Cattaraugus County, the soils were formed mainly from local shales and sandstones that were affected only slightly by glacial action. The deposits in the larger valleys, however, were influenced very markedly by material brought by the glacier from the north. The soils are considered in six groupings of classified soil types and a seventh group of miscellaneous soils. Major topics taken up are characteristics and crop adaptations of southwestern New York soils, the lime needs of clover on these soils, the production and use of manure, experimental field results, greenhouse fertilizer experiments, rotations and their fertilization, soil erosion control practices, varieties and rates of seeding, pasture improvement recommendations for southwestern New York, pasture management, and the use of rough, unproductive land.

Our responsibility with manure, F. S. Prince. (N. H. Expt. Sta.). (*Better Crops With Plant Food, 22 (1938), No. 5, pp. 17, 18, 35–38, figs. 2*).—Sheds to furnish protection from leaching and the use of superphosphate to prevent loss of free ammonia are regarded, together with careful choice of the time of spreading and the practice of harrowing in immediately after spreading, as some of the more important means whereby a loss of fertilizer value estimated, for New Hampshire alone, at $800,000 annually may be greatly reduced. It is noted that the saving of one-half this loss would represent as much plant food as is bought annually in the State, and that a similar situation exists in most of the North Eastern States.

New approaches to potash fertilization, J. B. Hester. (Va. Truck Expt. Sta.). (*Better Crops With Plant Food, 22 (1938), No. 4, pp. 17–19, 42–46, figs. 3*).—The need for nutrient balance in the soil is pointed out. "For example, a soil with a high calcium content will require more potash for adequate potash fertilization than a soil with a low calcium content, but the ultimate yield may be greater. Then there is a point at which it is more profitable to increase one nutrient in the soil over another, lest the plant is unable to get an adequate supply of the nutrient in the lesser amount." Experiments illustrative of this and other factors are mentioned.

It is pointed out, with respect to the Coastal Plain soils in general, that they contain between 2,000 and 8,000 lb. of total potash per acre in the top 7 in. or plowed surface. "This is far less than the quantity carried by many of the heavier types of soil in the United States. For instance, it is not uncommon for the heavier types of soil to analyze 2 percent in total potash. This represents approximately 40,000 lb. per acre 6-in. basis. When it is considered that approximately 5,000 lb. of K_2O represent the average total potash content in the plowed area of the Coastal Plain soils and that this has been subjected to 40 to 50 in. of rainfall each year for many years and has changed but little, not a great deal can be expected from the reserve supply."

Non-replaceable potash fixation, C. Lyman (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 42 (1938), No. 3, pp. 175–184*).—The author finds that some Hawaiian soils exhibit a tendency to fix potash in irreplaceable forms, and that fixation may be reduced by proper fertilization control, by frequent and small potash applications, and by subsurface fertilization. Potash fixation studies may be conducted on plantations by means of an adaptation of the rapid chemical method for the determination of potash in soils.

The leaching action of rain water upon dolomite and limestone separates incorporated with quartz in outdoor lysimeters, W. H. MacIntire, W. M. Shaw, and B. Robinson. (Tenn. Expt. Sta.). (*Soil Sci., 46 (1938), No. 1, pp. 9–19*).—The authors find their experiments to indicate "the importance of a fine state of division and of judicious incorporations of limestone or of dolomite to assure adequate supplies of nutrient calcium and magnesium for soils of high quartz content. This holds especially for the less soluble dolomitic limestone."

In a black Onslow fine sandy loam, "the unfixed fractions of finely divided high-calcic limestone will give to the free soil-water a calcium concentration greater than that resultant from comparable quantities of calcium held in the soil complex, and a consequential decrease in the amounts of magnesium derived from the native magnesic components of the soil. Undecomposed incorporations of dolomite are less soluble than the fixation complexes that follow distintegration of the dolomite. After the dolomite undergoes distintegration in the soil, the amounts of magnesium dissolved from the magnesic complexes by the free soil-water may exceed the amounts of calcium dissolved from the calcic complexes. The quantities of magnesium derived from rain waters, from soil, and from dolomite additions, and the aggregate supplies of calcium from the same sources are in such relationship that a toxic excess of magnesium will not occur. The desirability of maintaining an adequate supply of organic matter not only to develop a CO_2-impregnated soil-water to dissolve the incorporated limestones but also to produce organic complexes capable of fixing the calcium and magnesium supplied by the added limestones is also indicated."

Behavior of calcium, magnesium, and potassium sulfates, as influenced by limestone and by dolomite: A lysimeter study, W. H. MacIntire, W. M. Shaw, J. B. Young, and B. Robinson. (Tenn. Expt. Sta.). (*Soil Sci., 46 (1938), No. 3, pp. 229–247, fig. 1*).—About two-thirds of the total calcium added as sulfate was found in the leachings. Magnesium and potassium sulfates caused some increase in calcium outgo from the lysimeters. Added limestone increased the calcium outgo, but dolomite caused little or no increase. About 60 percent of the magnesium added as the sulfate appeared in the leachings. Calcium and potassium sulfates induced slight increases. Dolomite increased the magnesium outgo, but limestone decreased it. Neither calcium nor magnesium sulfate caused any increase in outgo of potassium from this soil, in spite of an unusually high content of exchangeable potassium, whereas both limestone and dolomite repressed the outgo of that element from soil alone and also from the soil treated with potassium sulfate. Each sulfate treatment caused a cation build-up.

Available calcium a factor in salt balance for vegetable crops, V. A. Tiedjens and L. G. Schermerhorn. (N. J. Expt. Stas.). (*Soil Sci., 42 (1936), No. 6, pp. 419–433, fig. 1*).—The authors have shown, both in soil experiments and in sand cultures, that soils having a reaction satisfactory for plant growth may still have too little available calcium to permit optimum protein and carbohydrate synthesis, and that an abundance of potassium may prevent the absorption of sufficient calcium from media of low calcium content. Plants grown with a ratio of 1 part calcium to 9 parts of sodium had from 1 to 3 percent less dry matter than did plants grown with 9 parts of calcium and 1 part of sodium. With this decrease in dry matter there was a poorer type of growth, which made plants more susceptible to wilting, to certain constitutional disorders, and to severe injury during periods of drought or heavy rainfall. The ratio of available calcium to potassium or sodium was found extremely important for germination of seed and growth of vegetable crops on Coastal Plain soils. It is suggested that the effect of cations on growth is due to the hydration of protoplasm induced by various cations.

It is further noted that "nitrate-carrying salts apparently have other functions in the plant than merely supplying the necessary nitrogen for growth, a fact worthy of consideration in fertilizer practices."

Studies on the behavior of manganese in soils, A. L. Prince and S. J. Toth. (N. J. Expt. Stas.). (*Soil Sci., 46 (1938), No. 2, pp. 83–94*).—It was shown that adsorbed manganese can be released quantitatively from soils by electrodialysis. This release from some cultivated Coastal Plain soils of New Jersey was similar to that of iron, aluminum, and magnesium. The mobility of manganese increased in the later stages of electrodialysis as the pH of the soil decreased. Manganese was carried primarily as ionogens rather than as ions, but appeared to exist in the soils both as exchangeable ions and ionogenic complexes. The equilibrium between these two forms of manganese was affected by soil conditions. The addition of humic acid to Colts Neck loam resulted in a greater release of manganese. The isoelectric precipitation of $Mn(OH)_2$ with sodium-saturated soil colloids did not reduce to any extent the cation exchange capacity of the colloids. In soils partially saturated with manganese and used to study the effect of lime on exchangeable and electrodialyzable manganese, as the lime applications increased the exchangeable manganese decreased. The electrodialyzable manganese always exceeds the exchangeable, due to the fact that electrodialyzable manganese represented the sum of exchangeable manganese and manganese transported as ionogenic complexes. It was also shown that manganese in the latter form is nonexchangeable but is soluble to some degree in 0.05 N hydrochloric acid. The surface soils contained more total manganese than did the subsoils.

The presence of titania in chemically unweathered soils, A. SALMINEN (*Soil Sci., 46 (1938), No. 1, pp. 41–47*).—The author shows that the titania content and the textural composition of soils are dependent upon each other in that fine-grained soils contain more titania than do coarse-grained soils. As the common titania minerals are hard and have a high density, their enrichment, especially in mechanical sediments, is improbable. In mechanical sediments the only minerals that can explain the variations of titania are the micas.

Occurrence of the minor elements in commercial fertilizers as determined spectrographically, S. S. BALLARD (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 42 (1938), No. 3, pp. 185–195, figs. 3*).—The author tabulates semiquantitative observations on fertilizer samples of phosphates, ammonium sulfate, potassium salts, and sodium nitrate.

Fertilizer mixtures for different crops (home mixing), W. H. RANKIN (*North Carolina Sta. Agron. Inform. Circ. 113 (1938), pp. [1]+10*).—Fertilizer formulas for various local combinations of crop and soil are given.

Commercial fertilizers in 1937–38, G. S. FRAPS, T. L. OGIER, and S. E. ASBURY (*Texas Sta. Bul. 565 (1938), pp. 47*).—The usual annual report of fertilizer analyses is accompanied by some related information.

Commercial fertilizers, L. S. WALKER, E. F. BOYCE, and L. E. DAVIS (*Vermont Sta. Bul. 440 (1938), pp. 27*).—In connection with the usual annual report for 1938 on fertilizer analyses (E. S. R., 78, p. 166), somewhat less complete fertilizer and a markedly greater proportion of crude stocks were found to have been used in comparison with last year's purchases. Data indicating the acid-forming or non-acid-forming properties of the fertilizers analyzed were determined.

AGRICULTURAL BOTANY

A textbook of general botany for colleges and universities, R. M. HOLMAN and W. W. ROBBINS (*New York: John Wiley & Sons; London: Chapman & Hall, 1938, 4. ed., pp. XVII+664, [pl. 1], figs. 482*).—In this edition (E. S. R., 73, p. 755) many changes have been necessitated by the results of recent researches. Among major changes, the sections on absorption and conduction by roots have been completely rewritten, as have also the sections dealing with the rise of sap in stems and the conduction of foods. The theory of active solute absorption has been given greater weight than in previous editions, the revised classification of tissues emphasizes progressive and regressive development, and a discussion of hormones in their relation to growth phenomena has been included. "In addition to the major changes mentioned above, there are scores of smaller ones which in many cases correct errors or make the meaning more understandable."

Standardization of terms for vessel diameter and ray width, L. CHALK (*Yale Univ. School Forestry, Trop. Woods, No. 55 (1938), pp. 16–23, fig. 1*).—The distribution of the mean tangential diameters of the vessels of 134 species of angiosperms and of the maximum ray widths of 150 are described, both being very similar and positively skewed. These distributions are used as a theoretical basis with which to judge existing systems of classification. The numerical values of the classes proposed by M. M. Chattaway[3] are said to agree closely with the theoretical requirements, and only one minor alteration is suggested. Some changes in the terms used to describe the classes are suggested to achieve uniformity.

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[3] Yale Univ. School Forestry, Trop. Woods, No. 29 (1932), pp. 20–28.

A rapid method for approximate specific gravity determination, J. G. Waugh. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), p. 536*).—The method involves weighing objects to one-hundredth gram and measuring their buoyancy in distilled water or other suitable liquids at room temperature by means of a hydrometer-like apparatus.

A simple inexpensive slide warmer, A. M. Schechtman. (Univ. Calif.). (*Stain Technol., 13 (1938), No. 4, pp. 137, 138, fig. 1*).—This slide warmer, costing about a dollar, consists essentially of an elongate box of 3-ply wood with a sheet of window glass at the top, baffled by a strip of sheet metal to distribute the heat from the bulbs below. The slides are placed on the glass, which is topped by a box-type cover.

A method of eliminating the electrification of paraffin ribbons, R. J. Blandau (*Stain Technol., 13 (1938), No. 4, pp. 139–141, fig. 1*).—The essential parts (cost, about $2) are a Ford T-TT induction coil to which are connected two 4-in. brass or copper strips. To the end of one is soldered a copper disk 1.5 in. in diameter, covered with heavy tinfoil. To the second is soldered half of a similar disk, with the surface covered with several layers of tinfoil extending ¼ in. beyond the straight edge and cut into 15–20 pointed projections. The coil is supplied with current from a toy train transformer (5–12 v or 4–6 a). In operation the disks are moved apart to a distance at which the spark just fails to jump, and the apparatus is set so that the brass strips are parallel to and 1–2 in. above the microtome knife.

Permanent preparations from rapid cytological technics, B. B. Hillary (*Stain Technol., 13 (1938), No. 4, pp. 161–167, figs. 4*).—Detailed procedures are outlined for applying the technics to temporary mounts of pollen mother-cell smears, insect salivary-gland chromosome smears, and squash preparations. There is said to be no shrinkage, distortion, or loss of brilliance of stain.

Recent investigations in vivo on the division of plant cells, W. A. Becker (*Bot. Rev., 4 (1938), No. 8, pp. 446–472*).—Following descriptions of methods, the author reviews recent studies of resting nuclei and chromosomes, mitotic spindles, and the kinetics of cytokinesis in the endeavor to present the modern state of investigations on mitosis in living plant cells.

The survival of plant cells immersed in liquid air, B. J. Luyet and G. Thoennes (*Science, 88 (1938), No. 2282, pp. 284, 285*).—Epidermal cells of onion immersed in liquid air were all dead on being brought back in air to room temperature, but if previously dehydrated by plasmolysis in from 5 to 15 percent sodium chloride solution before immersion in liquid air and returned rapidly to room temperature by immersing again in the salt solution, many cells remained intact and could be deplasmolyzed or further plasmolyzed. The authors believe that the prevention of crystallization prevents protoplasmic disorganization.

Developmental anatomy of the seedling of the rice plant, C. T. Yung (*Bot. Gaz., 99 (1938), No. 4, pp. 786–802, figs. 13*).—The embryo and seedling development are described.

Development and structure of the watermelon seedling, G. N. Hufford (*Bot. Gaz., 100 (1938), No. 1, pp. 100–122, figs. 49*).—The early developmental stages of the seedling and its gross structure are described.

Ontogeny and structure of the phloem of tobacco, K. Esau (*Hilgardia [California Sta.], 11 (1938), No. 8, pp. 343–424, pls. 18, figs. 14*).—This study was intended originally as a basis for investigations of the host-virus relations in the curly-top disease, but the many discordant statements in the literature (7-page bibliography) concerning some problems of histogenesis and nomenclature prompted a more detailed developmental study than at first planned. The principal problems considered in this monographic study concerned the origin and development of external and internal phloem, the distinction between primary and secondary phloem, the comparative structure of the mature and degenerating phloem, and the origin of the so-called "pericyclic fibers" which occur on the periphery of the phloem in mature stems. The study of the development and structure of the sieve tubes, though secondary, furnished information about the morphologic characteristics of these elements in the phloem at different stages of development. The petioles and stems of *Nicotiana tabacum* and *N. glauca* furnished the material for this study, the detailed results of which are described and discussed at length.

The multinucleate condition in fibers of tobacco, K. Esau (*Hilgardia [California Sta.], 11 (1938), No. 8, pp. 425–434, pls. 2*).—The fibers of the primary external and internal phloem of *Nicotiana tabacum* and *N. glauca* were found to exhibit a multinucleate condition resulting from repeated nuclear divisions with omissions of cytokinesis.

Relationship of the organic acids of tobacco to the inorganic basic constituents, G. W. Pucher, H. B. Vickery, and A. J. Wakeman. (Conn. [New Haven] Expt. Sta. et al.). (*Plant Physiol., 13 (1938), No. 3, pp. 621–630*).—"If it be assumed that the major constituents of the ash of cured and fermented tobacco leaves, with the exception of silicon dioxide, represent, respectively, basic or acidic ions combined essentially as salts in the cells, and if, in addition, allowance is made for the nicotine, ammonium, and nitric acid of the tissues, it is possible to calculate the total positive ions and the total negative ions present in terms of chemical equivalents. In all cases examined there is a large excess of positive ions, and the quantity so found is closely correlated with the quantity of ether-soluble organic acids as determined by a suitable titration method. The organic acids occupy a dominating position with respect to the balance of positive and negative ions in the tissues, and it is inferred that these substances are closely concerned in the phenomena of inorganic nutrition."

Morphological development of the fruit of the olive, J. R. King. (Coop. U. S. D. A.). (*Hilgardia [California Sta.], 11 (1938), No. 8, pp. 435–458, pls. 4, figs. 2*).—This study concerns the variety Mission of *Olea europaea* and includes the floral development, general vascular relations of the flower, development of the macrogametophyte, and the general morphological changes involved in fruit development, detailed results of which are described and discussed. The fruit of this variety is regarded as a drupe, since usually but one carpel and one ovule are actively involved in ovarial development, and since the fruit consists entirely of carpel tissue, the ovarial wall having both fleshy and dry portions.

Structure and growth of the shoot apex in Ginkgo biloba, A. S. Foster. (Univ. Calif.). (*Bul. Torrey Bot. Club, 65 (1938), No. 8, pp. 531–556, figs. 18*).—This morphological study is accompanied by 39 literature references.

Spiral systems in the vascular plants, J. H. Schaffner. (Ohio State Univ.). (*Bul. Torrey Bot. Club, 65 (1938), No. 8, pp. 507–529, figs. 21*).—This morphological and phylogenetic study is accompanied by a bibliography of 32 titles.

Effect of drought on protoplasmic elasticity, H. T. Northen. (Univ. Wyo.). (*Plant Physiol., 13 (1938), No. 3, pp. 658–660*).—The data presented are said to indicate that the protoplasmic elasticity in cells of rye coleoptiles increases when moisture is deficient. The rapidity with which these changes in elasticity occurred suggested that they were due to orientations of existing molecules or micelles rather than to the formation of new substances or increases in the amount of such substances as hemicelluloses.

The colloidal clay fraction of soil as a cultural medium, W. A. ALBRECHT and T. M. McCALLA. (Mo. Expt. Sta.). (*Amer. Jour. Bot., 25 (1938), No. 6, pp. 403–407, figs. 5*).—The preliminary trials reported are believed to suggest a large field of study opened up by the use of colloidal clay under controlled adsorbed ion supply, providing a means whereby more complete chemical analyses of soil and seed at the outset and of soil and plant at the close are possible with an accuracy and interrelation of results never before so closely approaching actual soil conditions. It appears to be indicated that equilibrium conditions obtain as to cation movement between plant and clay at certain degrees of saturation by the H-ion, for example, at which the plant fails to absorb more nutrients from the soil. Colloidal clay deficient in nutrient cations has even taken them from the growing plant, which finally contained less than in the seed at the outset. Physicochemical studies of the changes by colloidal clay in consequence of plant growth are believed to offer opportunities of determining soil behavior never before conceived possible in such complex mixtures as soil, and of contributing to a more complete understanding of plant nutrition in relation to soil conditions and to the soil as a nutrient for crop production.

Biological synthesis of amino acids from atmospheric nitrogen, A. I. VIRTANEN and T. LAINE (*Nature [London], 141 (1938), No. 3573, pp. 748, 749*).—This note presents the authors' conception of the mechanism of symbiotic nitrogen fixation in the root nodules of legumes, *l*-aspartic acid being synthesized in nitrogen fixation as a primary amino acid from which other amino acids are then formed.

Solutions of chlorophyll-protein compounds (phyllochlorins) extracted from spinach, E. L. SMITH (*Science, 88 (1938), No. 2277, pp. 170, 171*).—The author believes that the two proteins obtained may correspond with phyllochlorins *a* and *b*. It appears that the classical organic chemical studies of the chlorophylls and carotenoids were concerned with the prosthetic groups of extremely complex catalysts. Presumably there are many additional components concerned in photosynthesis, since phyllochlorin does not elicit photosynthesis in vitro.

Potash in plant metabolism: Deficiency symptoms as indicators of the role of potassium, G. N. HOFFER (*Indus. and Engin. Chem., 30 (1938), No. 8, pp. 885–889, figs. 3*).—This is a review, with 52 literature references.

Effectiveness of photoperiodic treatments of plants of different age, H. A. BORTHWICK and M. W. PARKER. (U. S. D. A.). (*Bot. Gaz., 100 (1938), No. 1, pp. 245–249*).—In this study the Biloxi soybean, which is very responsive photoperiodically, was used, and critical morphological examinations of fresh material were made before and after the short-day treatments. It was shown that the effectiveness of a photoperiodic treatment consisting of four 8-hr. days increases with the age of the plant to which it is applied until the plants are at least 6 weeks old. It was also indicated that other environal factors may influence the photoperiodic response. The intensity of illumination during treatment exercised a controlling influence on the response. Temperature, humidity, and other factors also play a part, and under conditions of very brief photoperiodic treatment the factors other than the length of the period of illumination may become limiting. The reason for differences in effectiveness of such treatment on plants of different ages is believed to be associated with differences in leaf area. The response of this species to photoperiodic treatment is said to be mainly an expression of the stimuli to which the leaves have been subjected.

Formative effects of radiation upon fern prothallia, F. B. CHARLTON. (Pa. Expt. Sta. et al.). (*Amer. Jour. Bot., 25 (1938), No. 6, pp. 431–442, figs.*

48).—The author attempted to compare the effects of different ranges of wavelengths on the growing prothallial cell in two species of ferns.

Growth regulators in the higher plants, P. Boysen Jensen (In *Annual Review of Biochemistry, VII,* edited by J. M. Luck and C. R. Noller. *Stanford University, Calif.: Stanford Univ. Press, 1938, vol. 7, pp. 513–528*).—A review covering the auxin and bios groups, with 96 literature references.

The use of green tissue test objects for determining the physiological activity of growth substances, A. E. Hitchcock and P. W. Zimmerman (*Contrib. Boyce Thompson Inst., 9 (1938), No. 5, pp. 463–518, figs. 8*).—Substances highly active for root formation in intact plants and in cuttings of herbaceous and woody types were tested for root-forming activity in tomato leaf cuttings. Important factors influencing root formation were the kind of growth substance, species or variety of cutting, age and relative activity of tissue used for cuttings, relative amount of leaf surface, and the atmospheric conditions during treatment. Results with tomato leaf and stem cuttings of more than 100 commercially important plant species are said to confirm the authors' previous conclusion that applied growth substance is transported upward and downward. Substantial evidence that applied growth substances moved upward in cuttings, and both upward and downward (in intact plants and severed shoots) from regions treated either with lanolin or aqueous preparations, was furnished by data in which the applied indole compound was detected in different parts of the treated plant by the Winkler-Petersen indole test.[3]

In the comprehensive study here reported in detail, the tomato has proved useful for determining how natural and applied growth substances influence growth, differentiation, and correlative responses in green tissue. Unlike etiolated test objects, the tomato is readily adapted to experimental study of all important physiological responses characterizing growth substances. It is believed that the tropic response of severed tomato shoots constitutes one of the most valuable and sensitive tests for determining substances which act as, and may be substituted for, the natural substances redistributed under the influence of gravity and light in green tissue. The modification of this test, whereby green tissue is depleted of natural substances inducing tropic responses by a predark treatment, makes it possible to determine which substances are highly active, and also to distinguish between those which are active and those which are not. As to specificity and sensitivity, the tomato tropic test is said to compare favorably with the *Avena* curvature test, but unlike it the tomato does not respond to simple acids (acid growth effect) nor exhibit basipetal polar transport as claimed by Skoog. However, considering the results with all test objects, there is believed to be much less specificity of growth substance action than has been claimed by the Utrecht school. "Data continue to accumulate in support of the idea that the growth substances known to date act as chemical stimulants in the sense postulated by Fitting."[4]

A bibliography of 127 references is included.

Induced parthenocarpy, F. G. Gustafson (*Bot. Gaz., 99 (1938), No. 4, pp. 840–844*).—The author briefly reviews some of his own studies (E. S. R., 76, p. 601; 77, p. 171; 79, p. 603) and those of others, concluding that ample demonstration is now available that fruits can be produced artificially by supplying growth-promoting substances to the ovary. Whether practical applications of the method can be made is another question.

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[3] Hoppe-Seyler's Ztschr. Physiol. Chem., 231 (1935), No. 4–5, pp. 210–212.

[4] Biol. Zentbl., 56 (1936), No. 1–2, pp. 69–86.

An experimental study on mitosis in the somatic cells of wheat, H. W. Beams and R. L. King (*Biol. Bul., 75 (1938), No. 1, pp. 189–207, pls. 3, fig. 1*).—This study is concerned primarily with showing how colchicine in certain concentrations and centrifuging at high speeds may affect the normal mitotic mechanism in rapidly dividing cells, and also with analyzing the mechanism that may eventually give rise to polyploids under experimental conditions. Colchicine markedly interferes with the dynamics of cell division. The cytoplasmic viscosity is lowered, and the nuclear and cytoplasmic processes in mitosis become disengaged. High-speed centrifuging stratifies the cell materials. Polyploidy is said to be more frequent in plants than in animals, partly because the polar centers in plants are not definitely localized.

Morphogenetical studies in the development of successive leaves in Aster, with respect to relative growth, cellular differentiation, and auxin relationships, A. L. Delisle (*Amer. Jour. Bot., 25 (1938), No. 6, pp. 420–430, figs. 19*).—It was found that successive rosette leaves on the same plant in *A. novae-angliae* and *A. multiflorus* and their hybrids have different relative growth rates and hence different shape indexes, while the successive leaves on the elongating axis have identical relative rates and similar shape indexes—true for either first or second season's growth. The shifts in relative growth rate in the heterogonic growth formula are believed to be clearly correlated with the elongation of the main axis. Elongation from the rosette could be induced artificially by increased illumination. This uniform pattern of foliar architecture in cauline leaves was invariably associated with elongation of the main axis from the rosette condition, and was correlated with differences in auxin conditions in the terminal bud meristem. Cell elongation in the epidermis and decrease in auxin output by the leaf were clearly correlated.

Achene weight and embryo size in the reciprocal hybrids from a cross between these two species differed greatly, depending on the maternal parent. This matrocliny in the embryo of the reciprocal hybrids is believed to be due to differences in the amount of reserve food material available for development in the ovary walls of the seed parent.

Relation of environment and of the physical properties of synthetic growth substances to the growth reaction, D. M. Bonner (*Bot. Gaz., 100 (1938), No. 1, pp. 200–214, figs. 6*).—It is concluded from this study that the acid curvature in the pea test is due to a greater growth of the cut than of the intact surface. This is explained as due to a higher concentration of active auxin on the cut surface, caused by a measurable decrease in the internal pH of the cut surface when split pea sections are placed in acid buffers. There was a correlation between the dissociation curves and the activities at different internal H-ion concentrations of cis-cinnamic and phenylacetic acids. By correcting for difference in pK, so that only equimolar concentrations of the free acid are compared, it was found that cis-cinnamic acid possesses the same activity as indole-3-acetic acid in the pea test. The activity of phenylacetic acid, though enhanced, was not so high as for indole-3-acetic acid. By pretreating pea sections with phenylbutyric acid and correcting for difference in pK where possible, indole-3-propionic, indole-3-butyric, naphthaleneacetic, anthraceneacetic, and cis-cinnamic acids were found to possess molar activities equal to that of indole-3-acetic acid in the pea test. The activities of phenylacetic acid and indole-3-valeric acids, though increased, were not brought to that of indole-3-acetic acid. It is suggested that compounds possessing the essential molecular structure probably all have the same activity in the pH dependent and stoichiometric growth reaction, and that the differences in their observed activities are due to differences in activities in secondary processes.

Growth and tropic responses of excised Avena coleoptiles in culture, G. S. AVERY, JR., and C. D. LA RUE (*Bot. Gaz., 100 (1938), No. 1, pp. 186–199, figs. 6*).—The tips of very young coleoptiles were found to contain relatively low hormone concentrations, and their most rapid increase occurred while the coleoptiles elongated from 2 to 6 mm. Coleoptiles excised at a length of 3 mm or less failed to attain the length of those grown under the same conditions but which were 5 mm long when excised, though they showed a far greater percentage increase at the start of the experiment. Addition of sucrose and mineral nutrients was markedly beneficial to growth of such coleoptiles in culture, but not after they had attained a length of 12 mm or more. Hence the older the coleoptile at time of excision, the less the growth response in culture. Indole-3-acetic acid in the nutrient agar with excised coleoptiles retarded longitudinal growth proportionally to its concentration. Decapitated excised coleoptiles capped with agar blocks containing indole-3-acetic acid gave significant length increases over controls. Excised coleoptiles gave geotropic and phototropic responses of rapidly decreasing magnitude over a 24-hr. period. In 10–14 hr. after excision, the capacity to respond fell to ±20 percent of that of controls, while the hormone concentration in the tips fell only to 55–65 percent of that of controls. It is concluded that growth hormone secreted by the coleoptile tips has no helpful relationship to coleoptile growth in culture. The smaller the coleoptiles at time of excision the greater their percentage increase in length in culture, in spite of their relatively lower content of hormone at time of excision. In coleoptiles excised when ±3 mm long growth continued in agar culture for 8 days or more. In no case were detectable concentrations of hormone in the tips found more than 48 hr. after excision. The evidence is believed to favor the idea that growth hormone is unnecessary for coleoptile elongation. Such an interpretation would not mean that hormone cannot stimulate coleoptile growth, but nowhere, the author believes, has it been unquestionably demonstrated that hormone must be present for longitudinal growth to occur. Hence, it is suggested that there is a probable difference between growth stimulating effects of such physiologically active substances and their necessity for growth in length. That growth hormone is necessary for growth is considered doubtful, but that it can catalyze growth is quite another matter.

Auxin distribution in seedlings and its bearing on the problem of bud inhibition, J. VAN OVERBEEK (*Bot. Gaz., 100 (1938), No. 1, pp. 133–166, figs. 10*).—An auxin extraction method, without the usual addition of acid, is described, acid being found to reduce the yield in some cases. The distribution of auxin concentration in etiolated seedlings of corn, oats, and peas was determined and expressed in indoleacetic acid equivalents which are independent of the test plant and the other conditions under which the test is made. In corn the region of greatest growth rate had the lowest auxin concentration, due to the great sensitivity to auxin in this region. The highest concentrations in corn and oat seedlings were in the basal regions of the primary leaves, while the average concentration was lowest in corn and highest in pea seedlings. It was shown that as soon as 12 hr. after decapitation of pea seedlings the auxin concentration in the lateral buds is increased, while in the stem it decreases after decapitation. Auxin application increased the concentration in the stem and in the upper lateral bud, and it is thus concluded that a direct action of auxin on the lateral bud is excluded as a possible explanation of dormancy. Phenylbutyric acid experiments indicated that high concentrations of auxin in the stem prevent auxin formation in the lateral bud. Auxin was most effective in inhibiting lateral buds when introduced into the vascular system of the stele. Applied to the stump of decapitated plants some time after decapitation, it was less effective in inducing bud inhibition the longer the time between decapitation and application. Based on all known data, an attempt is made to explain the auxin controlled bud inhibition and its mechanism of action. The bibliography contains 33 references.

Auxin in isolated roots growing in vitro, J. Van Overbeek and J. Bonner (*Natl. Acad. Sci. Proc., 24 (1938), No. 7, pp. 260–264*).—Isolated pea roots cultured in vitro contained auxin for at least 3 weeks after removal of the tip from the germinating seed. A steep auxin gradient occurred in these isolated roots, the highest concentration being near the tip. After 2 weeks in vitro, the roots appeared to contain less auxin than did the initial root tips.

Intercellular wound hormones produced by heteroauxin, J. R. Loofbourow and C. M. Dwyer (*Science, 88 (1938), No. 2278, pp. 191, 192*).—Heteroauxin proved to be toxic to yeast over a wide concentration range, and when yeast was subjected to it in toxic concentrations wound hormones were produced. This effect on yeast is deemed consistent with the mode of action suggested by Leonian and Lilly (E. S. R., 78, p. 173) for the heteroauxin effects on plant tissues.

Formation of β-(2-chloroethyl)-d-glucoside by gladiolus corms from absorbed ethylene chlorohydrin, L. P. Miller (*Contrib. Boyce Thompson Inst., 9 (1938), No. 5, pp. 425–429*).—Acetylation of purified preparations from gladiolus corms previously treated with ethylene chlorohydrin gave a crystalline acetyl derivative found to be identical with synthetic β-(2-chloroethyl)-*d*-glucoside tetra-acetate. The β-glucoside formed by the tissue from the absorbed chlorohydrin is thus β-(2-chloroethyl)-*d*-glucoside. "These results show that plant tissue can form glucosides from introduced aglucons even if such aglucons are substances which do not normally occur in plants. Glucoside formation may thus serve as a detoxication mechanism in plants."

Influence of indole-3-acetic acid on the respiration and growth of intact wheat seedlings, R. Pratt (*Amer. Jour. Bot., 25 (1938), No. 6, pp. 389–392, fig. 1*).—Wheat seeds were soaked 18–19 hr. in buffered and unbuffered solutions of indole-3-acetic acid and germinated on moist filter paper in Petri dishes for 44–46 hr. at 29° C. The seedlings were exposed to light only while transferring to and from the respiration vessels. No differences in respiration were detected immediately after the soaking period, but marked differences were found after rapid growth began. Concentrations of 0.1–100 p. p. m. of heteroauxin markedly accelerated respiration per unit dry weight of embryo and strongly depressed growth. The maximum increase followed soaking the seeds in a solution containing 50 p. p. m. at pH 4.2, the rate being nearly double that of controls. The acceleration of respiration was not the direct result of pH changes in the external solution, but was due to the heteroauxin. Nor was the higher oxygen consumption due directly to the additional carbon furnished by the heteroauxin, since other types of carbon compounds had little effect on respiration. The results are believed to indicate that heteroauxin is capable of markedly accelerating the metabolism of plant organs high in physiological activity.

Histological responses of Mirabilis jalapa to indoleacetic acid, K. C. Hamner (*Bot. Gaz., 99 (1938), No. 4, p. 912–954, figs. 28*).—The gross and histological data obtained at regular intervals over several weeks in both treated and control plants are described in detail and illustrated, and the responses of red kidney bean, tomato, and *Iresine lindenii* to indoleacetic acid are compared.

Thiamin and growth of Pythium butleri, W. J. Robbins and F. Kavanagh (*Bul. Torrey Bot. Club, 65 (1938), No. 7, pp. 453–461, figs. 3*).—Growth of *P. butleri* in mineral salt solution containing asparagine and sugar (solution D) was negligible, while a marked increase followed addition of thiamin or the vitamin pyrimidine. Apparently unlimited growth occurred when the salts of solution D were diluted, but the growth rate in this solution was increased by addition of thiamin or pyrimidine. In one case, contaminating bacteria increased the growth of the fungus. Formation of thiazole and of smaller amounts of pyrimidine was demonstrated. It is concluded that under the conditions imposed growth of *P. butleri* was limited by its thiamin production, which in turn was affected by the concentration of salts in the solution.

The effect of zinc on the growth of Rhizopus nigricans and the production of acid by this organism [trans. title], S. A. Waksman and J. W. Foster. (N. J. Expt. Stas.). (*Compt. Rend. Acad. Sci. [Paris], 207 (1938), No. 12, pp. 483–486*).—Among the heavy metals, the effect of Zn on the growth and nutrition of *Rhizopus* is said to be distinctly catalytic, glucose being utilized more completely in its presence. The proportion transformed into acid was diminished, while a greater part was utilized for energy than for cellular synthesis.

Vitamin B_1 and the growth of green plants, J. Bonner and J. Greene (*Bot. Gaz., 100 (1938), No. 1, pp. 226–237, figs. 2*).—In the light the vitamin B_1 content of pea plants increased rapidly, while in darkness it did not increase at all. The root tips of plants whose leaves were in the light contained more of this vitamin than those kept in the dark. Vitamin B_1 is thus produced in leaves in the light and thence transported to the growing root tip. When vitamin B_1 was supplied in small amounts to the roots of plants grown in the dark, both shoot and root growth was increased. When numerous species of plants were grown in nutrient sand cultures in the greenhouse in the light, addition of vitamin B_1 increased the shoot growth of plant species normally growing slowly, but no additional growth response to added vitamin occurred in fast growing annuals under similar conditions. It is suggested that the beneficial effects of manure on plant development may be owing in part to its vitamin B_1 content. The soil content of this vitamin may be expected to be derived also from plant debris and from soil microflora.

Intermediates of vitamin B_1 and the growth of Torula, W. J. Robbins and F. Kavanagh. (Univ. Mo. et al.). (*Plant Physiol., 13 (1938), No. 3, pp. 611–619, figs. 6*).—"Eight species of *Torula* were grown in a medium of mineral salts, asparagine, and dextrose, and the same medium to which the thiazole alone. the pyrimidine alone, or both intermediates of vitamin B_1 were added. Two species failed to grow in any of the four media; the growth of two was unaffected by the supplements; two grew distinctly better when both intermediates were used as supplements but were unaffected by either intermediate alone; the growth of two was much increased by the addition of pyrimidine or of pyrimidine and thiazole but unaffected by thiazole alone. By cultivating *Phycomyces blakesleeanus* in the solutions in which various species of *Torula* had grown it was demonstrated that a *Torula* which grew in the basic solution had synthesized thiazole and pyrimidine and one which grew in the solution supplemented with pyrimidine alone had synthesized thiazole."

[Abstracts of papers presented at the fortieth general meeting of the Society of American Bacteriologists] (*Jour. Bact., 36 (1938), No. 3, pp. 246, 247, 248, 249, 250, 254, 255, 256, 259–262, 305–308, 309, 319, 320, 322*).—The following papers are of interest: Nutrient Requirements of Butyric-Acid Butyl-Alcohol Bacteria, by R. W. Brown, H. G. Wood, and C. H. Werkman (Ala. Tuskegee Inst. and Iowa Expt. Sta.); The Utilization of Carbon Dioxide by the Propionic Acid Bacteria, by H. G. Wood and C. H. Werkman (Iowa); Occurrence of Glutathione in Microorganisms, by T. E. Miller and R. W. Stone (Pa. State Col.); Certain Factors Affecting the Growth of Yeast, by N. F. True, L. Paul, N. J. Miller, and P. S. Prickett; Physiological Events During the Dissimilation of Carbohydrate by the Living Bacterial Cell, by C. H. Werkman (Iowa); The Proteolytic Enzymes of Microorganisms, by M. J. Johnson (Univ. Wis.); Studies of Respiratory Enzymes Applied to Problems of Bacterial Metabolism, by P. W. Wilson (Univ. Wis.); Physiological Youth of Bacteria as an Important Factor in their Adaptive Formation of Enzymes, by C. P. Hegarty (Cornell Univ.); A Comparison of the Biological Activities of Certain Slow Lactose-Fermenting Bacteria and of Rapidly Fermenting Strains Derived From Them, by E. R. Hitchner, E. A. Donagan, and S. Alpert (Univ. Maine); The Sensitivity of *Propionibacterium pentosaceum* to Sodium Fluoride as a Function of the Conditions of Growth, by W. P. Wiggert and C. H. Werkman (Iowa State Col.); Dissimilation of Citric Acid by *Streptococcus paracitrovorus*, by C. R. Brewer and C. H. Werkman (Iowa); Enzyme-Systems in Nodules of Leguminous Plants, by D. W. Thorne and R. H. Burris (Univ. Wis.); Respiratory Enzymes of the Root-Nodule Bacteria, by R. H. Burris and D. W. Thorne (Univ. Wis.); Strain Variation and Host Specificity of *Rhizobium* Within the Cowpea Cross-Inoculation Group, and A Cytological and Histological Study of the Root-Nodules of the Peanut (*Arachis hypogaea* L.), both by O. N. and E. K. Allen (Univ. Hawaii); Combination of Mixed Groups of *Rhizobium* in a Single Culture, by V. S. Bond; Growth-Factor Requirements of *Rhizobium trifolii*, by P. M. West and P. W. Wilson (Univ. Wis.); The Presence and Significance of Oxalacetic Acid in Plant Tissues, by O. Wyss and P. W. Wilson (Univ. Wis.); Nature of Hydrogen Inhibition of the Symbiotic Nitrogen-Fixation Process, by S. B. Lee and P. W. Wilson (Univ. Wis.); The Fermentation of Unripe Cigar-leaf Tobacco, by D. W. McKinstry, D. E. Haley, and J. J. Reid (Pa.); and Variations in the Microflora of Wheat Roots Following Soil Amendments, by C. Thom, F. E. Clark, M. L. Fierke, and H. Fellows (U. S. D. A. and Kans.).

The distribution of heterotrophic bacteria in the bottom deposits of some lakes, A. T. Henrici and E. McCoy. (Univ. Minn., Univ. Wis., et al.). (*Wis. Acad. Sci., Arts, and Letters, Trans., 31 (1938), pp. 323–361, pl. 1, figs. 5*).—Counts from littoral stations were much higher than from profundal ones when the shoreward zone was occupied by aquatic plants, but lower for the sandy beaches. The plate counts showed a marked decrease with depth in the mud, statistical treatment of the entire series indicating a logarithmic curve to best fit the data. This is similar to a survivorship curve from a disinfection experiment, and may indicate that bacterial activity at the bottoms of lakes goes on almost exclusively at the mud-water level, the bacteria dying below. There are 34 literature references.

Influence of osmotic pressure on sporulation by Bacillus subtilis, J. L. Roberts, W. C. White, and E. Ojerholm. (Univ. Wis. et al.). (*Plant Physiol., 13 (1938), No. 3, pp. 649–653 figs. 2*).—From these studies it is believed that the influence of osmotic pressure, at least in the case of *B. subtilis*, seems not to be sufficiently great to warrant serious attention in future spore studies. The percentages of sporulation in media at osmotic pressures of 2–18 atmospheres were not significantly different, but there seemed to be a slight inhibition by pressures above 18 and below 2 atm.

The relation between mycorrhizae and the development and nutrient absorption of pine seedlings in a prairie nursery, A. L. McComb. (Iowa Expt. Sta.). (*Jour. Forestry, 36 (1938), No. 11, pp. 1148–1154, figs. 3*).—In a new nursery established on land previously farmed for many years a number of pine species were planted in a sandy loam with pH at 6.0–6.2. During the first season it was noted that mycorhizas were present on all the seedlings that were normally colored and that had continued growth, while on those that had become brown to reddish purple and stunted the mycorhizas were few or absent. From quantitative data obtained for Virginia pine seedlings it is concluded that these differences in development were due to differences in phosphorus availability, and that the seedlings, in this soil, were unable to obtain an adequate supply of phosphorus without the aid of mycorhizas.

Growth-ring studies of trees of northern Florida, W. L. MacGowan (*Fla. Acad. Sci. Proc., 1 (1936), pp. 57–65, figs. 9*).—Ecological studies of typical growth habits of certain north Florida trees as derived from examination of their annual rings of growth are here presented.

GENETICS

Genetics, H. E. Walter (*New York: Macmillan Co., 1938, 4. ed., [rewritten], pp. XVII+412, figs. 150*).—A completely rewritten edition of the book previously noted (E. S. R., 48, p. 468).

Statistical methods, G. W. Snedecor (*Ames, Iowa: Collegiate Press, Inc., 1938, [2. ed.], rev., pp. XIII+388, figs. [22]*).—A revised edition of the book previously noted (E. S. R., 78, p. 434) with minor changes.

Chromosome studies in the Malvaceae and certain related families.—II, J. H. Davie (*Genetica ['s Gravenhage], 17 (1935), No. 5–6, pp. 487–498, figs. 10*).—New chromosome numbers (2*n*) established for different species of malvaceous genera since the previous report (E. S. R., 70, p. 315) include *Lavatera cachemiriana* and *L. triloba* 44, *L. micans* 42, *Sidalcea parviflora* 26, *Anoda wrightii* 36, and *Sida napaea* 28. A considerable uniformity in the morphology of the chromosomes was observed. Examination of meiosis in *Theobroma cacao* showed that $n=10$. That American tetraploid cottons arose in America in pre-Columbian times from diploid American types and not from an American-Asiatic cross is suggested on historical grounds.

A contribution to a cytogenetical survey of the Malvaceae, C. E. Ford (*Genetica ['s Gravenhage], 20 (1938), No. 5–6, pp. 431–452, figs. 28*).—This continuation of the cytological study noted above reports chromosome numbers of 32 species from 13 genera representing 3 of the 4 tribes of Malvaceae. General observations are described under the relevant genera.

Variation in carotinoid pigment concentration among inbred and crossbred strains of corn, I. J. Johnson and E. S. Miller. (Minn. Expt. Sta.). (*Cereal Chem., 15 (1938), No. 3, pp. 345–350*).—Mature grain from 19 inbred lines of corn ranging from light to dark yellow in endosperm color varied widely in percentage of total carotenoid pigments, but this variation was not associated closely with intensity of yellow endosperm color. The number of dominant *Y* genes for yellow endosperm color was related closely to concentration of total carotenoids and β-carotene, the percentage concentration being in direct proportion to such genes. The percentage of carotenoid pigments in leaf tissue of young corn plants from white endosperm lines was slightly higher than from their yellow endosperm sister lines. The formation of carotenoid pigments in the leaf tissues and in the endosperm appeared to be independent. The percentage of chlorophyll and carotenoid pigments in corn leaf tissue were associated positively.

Studies in the nature of the pomological variety.—I, A hetero-chimeric apple sport and its vegetative progeny, V. R. Gardner (*Michigan Sta. Tech. Bul. 161 (1938), pp. 14, pls. 4*).—A detailed description is presented of the fruits of an apple tree almost identical to Northern Spy in vegetative appearance but producing fruit of great diversity in form, season of ripening, and color distribution. Because of its apparent commercial value, scions of the original tree were top-worked into a group of Grimes Golden trees, and the new variety was designated as Graham. As with the parent tree, most of the top grafts showed a greater degree of variability in form, color, and time of ripening than occurs in standard varieties. However, none was as variable as the parent. Types of fruit were found which differed as greatly from one another as do accepted varieties.

The author believes that the Graham apple is a chimera, either periclinal or mericlinal in nature. The behavior is compared to that of *Pelargonium zonale* and other inconstant plant forms. Since the diversities are not limited to a single feature, the term heterochimeric is suggested as applicable to the new apple. It is also suggested that a number of other varieties now commonly grown, especially those which exhibit a large amount of variability, may be likewise chimeras.

Comparative studies on the chromosome numbers in sheep, goat, and sheep-goat hybrids, R. O. Berry (*Jour. Heredity, 29 (1938), No. 9, pp. 343–350, figs. 3*).—Chromosome studies were made at the Carnegie Institution from amnion cells of 30-day-old embryos of goats, sheep, and hybrids produced by mating Merino rams with Angora does at the Texas Experiment Station. The most likely chromosome numbers were 60 for goats, 54 for sheep, and 57 for hybrids, but some variations were found which may be due to chromosome fragmentation, nondisjunction, end-to-end fusion, etc. Differences between the species may have arisen in some of these ways. The four largest chromosomes of the sheep were larger than any in the goat and had a characteristic J or U shape. These were observed in the hybrid at metaphase. The death of the hybrid embryos at two-fifths of the gestation period may be due to the differences in the position of allels on the homologous chromosome or failure of recessive lethals to have a normal dominant gene in the zygote.

Hybridization of domestic cattle, bison, and yak, A. Deakin, G. W. Muir, and A. G. Smith (*Canada Dept. Agr. Pub. 479 (1935), pp. 30, pl. 1, figs. 11*).—A brief description is given of experiences in crossing and subsequent breeding of domestic cattle, bison, and yaks by private breeders and the Dominion Experimental Farms from 1916 to 1935. Although the numbers were small, some conclusions are presented regarding the inheritance of contrasting characteristics of color, conformation, and other morphological characters. Failure to mate and sterility of the hybrids of bison and cattle were the more difficult problems encountered. Histological study of testes from sterile hybrids showed the seminiferous tubules to be in a degenerated condition with absence of germinal epithelium.

The morphology of a teratological calf, R. Watson (*Iowa Acad. Sci. Proc., 43 (1936), pp. 369–371, fig. 1*).—A two-headed monster is described.

Merle or calico foxhounds, J. McI. Phillips and E. D. Knight (*Jour. Heredity, 29 (1938), No. 9, pp. 365–367, fig. 1*).—Dogs exhibiting the merle pattern are always heterozygous. Dogs homozygous for this factor are white with slight areas of color on head and ears, have china or blue eyes, and are always deaf. Heterozygous merle may affect either black and tan or plain tan to give the calico pattern.

Inheritance of resistance and susceptibility to Salmonella aertrycke in mice, H. O. Hetzer. (Iowa State Col.). (*Iowa Acad. Sci. Proc., 43 (1936), pp. 394, 395*).—Selection for resistance to *S. aertrycke* in mice reduced mortality from 98 percent at the start to 8 percent in the fourteenth generation. Resistance seemed from crosses and backcrosses to be controlled by multiple factors which were partially dominant to susceptibility.

Physiologic and genetic studies of crooked keels in chickens, D. C. Warren (*Kansas Sta. Tech. Bul. 44 (1937), pp. 32, figs. 3*).—After six generations of selection for and against crooked keel bones in White Leghorns, the proportions of crooked-keeled birds were increased and decreased in different lines. However, both types were still produced in both high and low crooked-keel-bone strains. The results showed that although the condition was inherited, its occurrence was influenced by the sharpness of perches, the age of starting the birds to roost, and amount of time spent on the perches. Under normal roosting conditions, the crooked-keeled strain showed an incidence of from 60 to 80 percent of crooked keels, and the straight-keeled strain an incidence of less than 10 percent. The crooked-keeled condition usually developed between 6 and 12 weeks of age. The ash content of the breast bones of crooked-keeled birds was less than that of normals in the same groups and strains, but there was no difference in the ash content of the leg bones. However, affected birds were not more susceptible to rickets on a deficient diet than straight-keeled birds. Males showed a higher incidence of deformity than females. Season had no influence. This condition clearly shows the interaction between hereditary factors and environment in the characters expressed.

"Eclipse plumage," possibly a universal factor in the sequence of moult in ducks, E. F. Stead (*Roy. Soc. New Zeal., Trans. and Proc., 68 (1938), No. 1, pp. 102–104*).—Attention is called to the so-called eclipse plumage as a stage in the double molt of many ducks.

Further observations on moult in the duck family, E. F. Stead (*Roy. Soc. New Zeal., Trans. and Proc., 68 (1938), No. 1, pp. 105, 106*).—Further observations suggested that probably all members of both sexes of the order of Anatiformes have double molts annually.

Sexual dimorphism in the down-color and adult plumage of geese, C. D. Gordon. (Ala. Polytech. Inst.). (*Jour. Heredity, 29 (1938), No. 9, pp. 335–337, figs. 2*).—Sex dimorphism was exhibited by a strain of geese common in Alabama in which adult males were white with only a few gray feathers and sky-blue eyes. The plumage of females was predominantly gray with dark-gray or brown iris color. The down color of goslings was lighter for males than for females.

Daily light ration and gonadal activity in the English sparrow, Passer domesticus, A. R. Ringoen and A. Kirschbaum. (Univ. Minn.). (*Minn. Acad. Sci. Proc., 5 (1937), p. 32*).—Testes were stimulated to sperm production in winter by lengthening the day by artificial light for 6 weeks. Females required about 10 weeks' treatment to cause enlargement of the ovary and oviduct. Capping the birds largely prevented the light effect.

Factors controlling the diurnal spermatogenic cycle of the male sparrow (Passer domesticus), G. M. Riley (*Iowa Acad. Sci. Proc., 43 (1936), p. 396*).—Spermatogenesis in the sparrow, which normally occurs at from 2 to 4 a. m., could be induced during the day by inversion of the light period or by lowering the body temperature by feather clipping and exposing to a low temperature, and could be prevented at night by keeping the bird active and the temperature high. Injection of pregnant mare serum induced spermatogenesis in 5 hrs., indicating that normally the darkness and quiet lowers body temperature, which is necessary to release the gonadotropic hormone from the pituitary.

Studies in sex physiology.—XIX, The influence of age on (a) amount and (b) nature and composition of the allantoic and amniotic fluids of the Merino ewe, A. I. and A. P. Malan and H. H. Curson (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 9 (1937), No. 1, pp. 205–221, figs. 8*).—Continuing this series (E. S. R., 79, p. 37), data are presented on the amount and composition of the allantoic and amniotic fluids of 10 Merino ewes at different stages of pregnancy.

The postpartum formation of egg cells in the cat, B. F. Kingsbury. (Cornell Univ.). (*Jour. Morph., 63 (1938), No. 2, pp. 397–419, pls. 3*).—A study of 108 ovaries from cats showed that primary oocytes undergo a considerable amount of degeneration, but there was no evidence of the formation of egg cells from the residual follicle cells which remained for an undetermined time. There was no good evidence of the formation of egg cells from the surface epithelium.

Intra-ocular homotransplantation of prepuberal testes in the rat, C. D. Turner (*Amer. Jour. Anat., 63 (1938), No. 1, pp. 101–159, pls. 5*).—Successful transplantation of testicles from newborn rats into the anterior ocular chamber of normal and castrated male and female rats is noted. Such transplants in male hosts prevented the loss of secretory activity of the secondary sex glands for as long as 15 mo. It appeared that the variation in the structure and function of the grafts in different types of animals were conditioned by the amount and kind of gonadotropic hormones secreted by the pituitaries.

The follicular cycle in the sexually mature thirteen-lined ground squirrel (Citellus tridecemlineatus Mitch.), E. C. Pliske. (Univ. Minn.). (*Jour. Morph., 63 (1938), No. 2, pp. 263–287, pls. 3*).—Study of ovarian preparations from 78 ground squirrels showed that ova were usually produced in the adult animal by ingrowths in the ovary of activated cords of cells from the germinal epithelium. Many germinal epithelial cells not forming ova functioned as follicular cells.

The development and atresia of the Graafian follicle and the division of intra-ovarian ova in the guinea pig, M. T. Harman and H. D. Kirgis. (Kans. State Col.). (*Amer. Jour. Anat., 63 (1938), No. 1, pp. 79–99, pls. 2*).—Study of follicles in the ovaries of 62 guinea pigs in various stages of the oestrous cycle and pregnancy showed that degeneration of the young follicles is a regular process. This consists of enlargement of the surrounding follicle cells until a corpora-lutea-like cyst is formed. The pronounced degeneration of the ovum which occurs may result in several nuclear and cytoplasmic divisions. Medium and large follicles are most numerous on the third day of the oestrous cycle and the twelfth day of pregnancy. The percentage of degenerating follicles is highest at that time. Intraovarian ova which had passed through several cytoplasmic and nuclear divisions and formed the first segmentation spindle were frequently found in medium or large follicles. In every case in pregnant females the number of corpora lutea in the ovary equaled the number of embryos found in the corresponding cornu of the uterus.

Experimental modification of the accessory sexual apparatus in the hen, A. W. Greenwood and J. S. S. Blyth (*Quart. Jour. Expt. Physiol. and Cog. Med. Sci., 28 (1938), No. 1, pp. 61–69, figs. 2*).—Studies were made of the accessory sex organs of 21 chicks raised from eggs injected with 1 mg of oestrone 48 hr. after the beginning of incubation. Thirteen of the 21 were females and 8 males. All of the experimental females possessed paired and incompletely developed oviducts, and only 1 of 6 hens laid normal eggs.

"It is suggested that either the oestrone injection into the egg interfered with the normal processes of differentiation of the Müllerian duct into the sex duct in the embryo, rendering it incapable of efficient response to the hormone stimulus subsequently supplied by the functional ovary of the individual, or that the normal level of secretion of female hormone by the fowl's ovary is sufficient only for the complete development of a single duct."

Studies of prenatal development in farm animals, L. M. Winters. (Minn. Expt. Sta.). (*Minn. Acad. Sci. Proc., 5 (1937), pp. 42–45*).—Prenatal development in sheep and cattle has been studied from 200 sheep embryos and 78 cattle embryos of known ages. Progress in artificial insemination in cattle and sheep is described. Lambs have resulted from semen kept for 5 and 6 days in the laboratory before being used for artificial insemination.

A study on the control of length of gestation in the rat, with notes on maintenance and termination of gestation, R. E. Kirsch (*Amer. Jour. Physiol., 122 (1938), No. 1, pp. 86–93*).—The results of a series of experiments on pregnant rats in which fetuses were removed and replaced by paraffin showed that if any placentae were left intact pregnancy was maintained and parturition occurred at the expected time. Irregular effects of double ovariectomy on the maintenance of pregnancy suggested that quantitative needs may determine the essentiality or nonessentiality of the ovary. It was believed that the "placento-uterine complex" contributed to the maintenance of pregnancy by secreting progesterone or a related substance, which if insufficient was supplemented by secretions from the ovary. As a result of parturition occurring even when nerve connections were destroyed, the onset of labor was concluded to be under the hormonal control of the placento-uterine complex. Termination of pregnancy seems to result either from diminution of some inhibitory hormone, initiation of secretion of a stimulating principle, or both from the placento-uterine complex. Gonadotropic substances and oestrogens may have a part in parturition.

Studies on prolonged pregnancy in rats, F. Bøe (*Acta Path. et Microbiol. Scand., Sup. 36 (1938), pp. [7]+146, figs. 29; Fr., Ger. abs., pp. 123–138*).—Studies made of the effect of various hormones on parturition and fetal development in the rat showed that gestation was prolonged by the administration of gonadotropic hormone from pregnant mare serum, urine from pregnant women, oestrone, progesterone, and hypophysectomy in the last third of pregnancy. The inhibition of fetal development and production of mummies was most pronounced from oestrin and pregnant mare serum. Such inhibition was also noted in the placenta.

Influence on the duration of gestation on the injection of pregnancy urine extract in the rat before and after implantation, J. L. King (*Amer. Jour. Physiol., 122 (1938), No. 2, pp. 455–459*).—As human pregnancy urine administered late in pregnancy to the rat delays parturition, study was made of the effect of administration from the third to the eleventh day of gestation (before and after implantation). Before implantation the injection had no effect, but after implantation there was a delay of from 2 to 3 days in parturition. However, some of the fetuses were born alive.

The responses of normal and castrate female sparrows to injections of pregnant mare serum, R. A. Miller (*Iowa Acad. Sci. Proc., 43 (1936), pp. 395, 396*).—Injections of pregnant mare serum into sparrows from which the ovaries were removed were found to stimulate hypertrophy of the right rudimentary gonad.

The bioassay of mare serum hormone: A comparison of ovarian and uterine weight methods, G. F. Cartland and J. W. Nelson (*Amer. Jour. Physiol., 122 (1938), No. 1, pp. 201–206, fig. 1*).—The weight increase in the ovaries, uterus, and other organs of from 21- to 23-day-old female rats induced after 96 hr. by three divided daily doses of gonadotropic hormone from pregnant mare serum is given for different amounts of the hormone. The response for ovarian weights between 35 and 145 mg was practically a straight-line function of the size of the dose. The uterine weight response was more sensitive than the ovarian weight for small doses, but larger doses had little additional effect on the uterus. Luteinization in the ovaries was a regular function of dosage.

A comparative study of the gross and microscopic effects of follicle stimulating hormone and anterior pituitary sex hormone on the rat testis, H. S. Rubinstein and H. M. Radman (*Amer. Jour. Physiol., 122 (1938), No. 2, pp. 319–324, figs. 2*).—Menopausal urine and extracts of sheep pituitaries both hastened testicular descent in the immature male rat. The follicle-stimulating hormone produced proliferation of the germinal epithelium and growth of the interstitial tissue in mature and immature rats to a greater degree than pituitary extract.

On the reliability of present methods for characterizing two gonadotropic hormones, follicle-stimulator and luteinizer, F. J. Saunders and H. H. Cole. [Calif. Expt. Sta.]. (*Endocrinology, 23 (1938), No. 3, pp. 302–317, figs. 6*).—A series of experiments dealing with the comparative augmenting properties of several substances, including the luteinizing fraction of extracts of the pituitary on the action of the follicle-stimulating fraction, is reported. These studies and comparisons of the effects of different methods of administration led to the conclusion that differences exist in the response to the follicle-stimulating and luteinizing fractions of extracts of the pituitary. However, it is not certain that different hormones are as much concerned as differences in the method of injection, rate of absorption, and state of the ovary. Attention is called to the fact that the lactogenic hormone may be responsible for maintaining functional corpora lutea.

The rôle of gonadotropic hormone in the maintenance of luteal function, J. M. Robson (*Quart. Jour. Expt. Physiol. and Cog. Med. Sci. 28 (1938), No. 1, pp. 49–59, figs. 5*).—Rabbits were hypophysectomized following the induction of pseudopregnancy by the intravenous injection of gonadotropic hormone from pregnancy urine. The corpora lutea were maintained for 3 days by the administration of oestrin, but gonadotropic hormone from human pregnancy urine failed to maintain luteal function longer. The failure of the gonadotropic hormone to stimulate the production of oestrin, which seems to be a controlling factor in luteal function, is given as a possible explanation of the result. A synthetic oestrogenic substance, triphenylethylene, maintained luteal function in three hypophysectomized does.

Cyclic inhibitory influence of the rat's ovary on the uterine response to estrin, S. C. Freed and S. Soskin (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 3, pp. 391–394, fig. 1*).—Action of ovarian hormones in inhibiting oestrus (E. S. R., 76, p. 777) was demonstrated by the uterine response in normal and ovariectomized rats to the administration of dihydroxyoestrin benzoate. A typical oestrous reaction was obtained in all the castrates. Cornification of the vaginal epithelium occurred in all normals and castrates.

In another experiment the oestrin preparation was administered to normal females on different days of the oestrous cycle, and it was found that the state of the uterus depended on the day of the cycle when the examination was made. The cycle-inhibiting factor in the ovary was considered as something other than progestin because this hormone produces progestational changes in the uterus and inhibits vaginal cornification.[5]

Further studies on the rôle of progesterone in the inhibition of estrous cycles in the albino rat, W. A. Phillips and L. E. Young (*Amer. Jour. Physiol., 122 (1938), No. 1, pp. 175–178, fig. 1*).—In further bio-assays on rats

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[5] Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 2, pp. 198–200.

(E. S. R., 78, p. 614), a crude ovarian extract containing progestin was found to be three times as effective in inhibiting oestrus as an equivalent amount of crystalline progesterone, suggesting that either impurities in the crude extract augmented the oestrus-inhibiting action of progesterone or some other substance is present in the crude extract which inhibits oestrus.

Changes in the hypophysis and the ovaries of rats chronically treated with an anterior pituitary extract, J. B. Collip, H. Selye, and J. E. Williamson (*Endocrinology, 23 (1938), No. 3, pp. 279–284, figs. 4*).—Continued daily administration of an extract of pig anterior pituitary to female rats from 21 to 30 days and 2.5 mo. of age caused a progressive increase in the ovarian weight due to the formation of many corpora lutea for 4 weeks in the immature and 2 weeks in the mature animals. Decreases in ovarian weight followed. The maximum ovarian weight was not attained until after about 6 weeks of treatment in hypophysectomized animals. The appearance of signet-ring cells paralleled the ovarian atrophy. It appeared that the animals developed an immunity to the pituitary extract.

[Effect of massive injections of Progynon-B on the acceleration of ova in their passage through the Fallopian tubes] (*Endocrinology, 22 (1938), No. 6, pp. 631–638, figs. 6; pp. 639–642, fig. 1*).—Two papers are presented:

Fate of ova accelerated in their rate of passage through the Fallopian tubes of mice by massive injections of Progynon-B, H. O. Burdick and R. Whitney.—Injections of from 100 to 500 rat units of Progynon-B into mice cause such rapid acceleration of the passage of fertilized and unfertilized ova through the Fallopian tubes that the uterus has insufficient sustaining fluid, the ova degenerate, and pregnancy fails.

Acceleration of the rate of passage of fertilized ova through the Fallopian tubes of rabbits by massive injections of Progynon-B, R. Whitney and H. O. Burdick.—Ova accelerated in their passage through the Fallopian tubes in rabbits by doses of 5,000 rat units of Progynon-B degenerated in the uterus and pregnancy was prevented.

Activation of testosterone by higher fatty acids and their acid sodium salts, M. Ehrenstein and E. L. Corey (*Jour. Biol. Chem., 122 (1938), No. 2, pp. 297–302*).—The action of forms of testosterone on the accessory sex organs of castrated rats was markedly stimulated by administration with palmitic or stearic acids or their acid sodium salts.

Artificial insemination of farm animals, L. M. Winters, R. E. Comstock, C. L. Cole, W. W. Green, and J. J. Bulik (*Minnesota Sta. Bul. 336 (1938), pp. 20, figs. 9*).—A brief discussion of methods of artificial insemination in horses, cattle, and sheep, with accounts of methods of collecting semen and success with artificial insemination of cattle and sheep.

Artificial vagina for the collection of semen of the stallion, A. C. Gonzaga (*Philippine Jour. Anim. Indus., 6 (1937), No. 5, pp. 515–519, pls. 6*).—A discussion and illustrations of the use of the artificial vagina for collecting horse semen.

Artificial breeding of turkeys, W. H. Burrows and S. J. Marsden. (U. S. D. A.). (*Poultry Sci., 17 (1938), No. 5, pp. 408–411*).—An average fertility of 80 percent was produced in turkey eggs by artificial insemination at intervals ranging from 1 week to 30 days. In one pen of 10 hens mated with an old tom, fertility was increased from 7.5 percent in natural matings to 88.4 percent by artificial insemination. There were no ill effects from the practice as measured by egg production and condition of the hens and toms.

FIELD CROPS

[Agronomic research in the Southern States] (*Assoc. South. Agr. Workers Proc., 39 (1938), pp. 18–22, 27, 29, 30, 47, 48, 49, 50, 51–55, 56–67, 100, 104, 105, 108, 114, 140, 141*).—Papers concerned with agronomic problems and presented at the convention of the Association of Southern Agricultural Workers at Atlanta, Ga., February 2–4, 1938, reported in abstract form, included Grains (pp. 18, 19) and Cotton Degeneration (p. 66), both by J. F. O'Kelly, The Efficiency of Calcic and Dolomitic Limestone in Making Neutral Fertilizers, by C. Dorman (p. 62), and The Influence of Potash on Grade and Shape of Triumph Sweet Potato in Mississippi, by W. S. Anderson (p. 100) (all Miss. Expt. Sta.); Silage—Corn and Sorghum, by Z. A. Massey and S. V. Stacy (pp. 19, 20), Temporary Grazing Crops, by S. H. Starr (pp. 21, 22), Peanut Breeding, by B. B. Higgins (pp. 57, 58), and Results From the Use of Limestone and Magnesium Fertilizers in Georgia, by E. D. Matthews (pp. 62, 63) (all Ga.); Small Grains, by W. R. Horlacher and M. Lyons (pp. 20, 21) (Ark.); Hay, by L. R. Neel (p. 22), A New Material for Supplying Readily Available Magnesium in Fertilizers, by W. H. MacIntyre (pp. 59, 60), The Use of Electrical Heat in Curing and Storing Sweet Potatoes, by A. Meyer (p. 104), and Problems in the Germination of Cotton Seed, by D. M. Simpson and G. M. Stone (pp. 140, 141) (all Tenn.); The Production of Corn or Substitutes for Corn to Meet Livestock Requirements in the South, by E. C. Blair (p. 27) (N. C.); Soil Types Adaptable to Permanent Pastures, by H. P. Cooper (pp. 29, 30), The Reliability of Rapid Chemical Tests for Predicting Nutrient Need of Soils, by F. Moser (pp. 61, 62), and Variation in Plant Production of Individual Roots and Individual Hills of the Porto Rico Sweet Potato, by J. B. Edmond (pp. 104, 105) (all S. C.); Reducing Fertilizer Grades to Minimum Requirements in Mississippi, by J. C. Holton (pp. 47, 48); Profitable Soil Improvement for Southern Soils, by J. F. Freeman (pp. 49, 50) (Ky.); Relation of Physical Properties to Erodibility of Soils, by T. C. Peele (p. 51), Choice and Arrangement of Vegetation for Erosion Control, by R. Y. Bailey (pp. 51, 52), The Development of a Program for Increasing the Acreage and Effectiveness of Winter Legumes for Soil Conservation, by G. W. Dickinson (pp. 52–54), Adapting Soil Conservation Practices to Soil Conditions for Erosion Control, by M. W. Lowry (p. 54), Progress in Oat Breeding for the South, by T. R. Stanton (pp. 56, 57), Problems in Connection With Austrian Winter Field Pea Breeding for Disease Resistance, by J. L. Weimer (pp. 58, 59), Hybridization of Vetches, by P. Tabor (p. 59), The Effect of Various Grades of Fertilizers on the Salt Content of the Soil Solution, by L. M. White and W. H. Ross (p. 60), Recent Study in the Anatomy and Development of Cotton Fibers, by T. Kerr (pp. 65, 66), The Applicability of Certain Recent Experimental Designs to Cotton Research, by O. A. Pope (pp. 66, 67), and Cotton Seeds May Differ Widely in Composition, by G. S. Meloy (p. 114) (all U. S. D. A.); Corn Improvement in the South, by F. H. Hull (pp. 54, 55) (Fla.); Grass Breeding for the Coastal Plain Area, by G. W. Burton (p. 55) (U. S. D. A. and Ga.); Effects of Different Nitrogenous Fertilizers on the pH and Available PO_4 of Soils and Their Relation to the Yield of Cotton, by F. L. Davis (p. 61), Practical Method of Maintaining Characteristics in the Porto Rico Sweet Potatoes, by J. G. Richard (p. 105), and The Breeding and Improvement of Sweet Potatoes, by J. C. Miller (p. 108), (all La.); Potash Requirements of Cotton in Relation to Acid and Neutral Fertilizers, by E. R. Collins, R. P. Bledsoe, J. J. Skinner, and J. H. Hunter (p. 63) (N. C., Ga., and U. S. D. A.); Results of Regional Pasture Fertilizer Experiments as Obtained at Gainesville, Florida, by G. E. Ritchey and W. E. Stokes (p. 64) (U. S. D. A. and Fla.); and Notes on the Progeny of a Brown Lint by Green Lint Cross of Upland Cotton, by T. R. Richmond, R. E. Harper, and D. T. Killough (pp. 64, 65) (U. S. D. A. and Tex.).

[Field crops research in Utah]. (Partly coop. U. S. D. A.). (*Utah Sta. Bul. 282 (1938), pp. 32–41, 71, 72, 111, 112, figs. 6*).—Progress results and outstanding accomplishments are reported from agronomic experiments (E. S. R., 77, p. 40) at the station and substations for the biennium ended June 30, 1938, and longer periods, including varietal trials with spring and winter wheat, oats, barley, corn, alfalfa, potatoes, and miscellaneous forage grasses; grain sorghum v. corn; breeding work with barley, wheat, oats, alfalfa, and grasses; seed production studies with alfalfa; experiments with strawberry clover; fertilizer tests with alfalfa and sugar beets; water requirements of wheat, corn, peas, and sugar beets; wheat experiments on dry land concerned with varieties, tillage, cultural and harvesting practices, type of plowing, manuring, green manuring, stubble burning, and cropping systems; effect of different rates of irrigation on protein content of wheat, milling tests, chemical analyses of wheat and sugar beets, and a storage test with wheat flour; comparisons of reseeding methods and plant species for overgrazed range; effects of smelter smoke on crops; and tillage and other weed control measures.

Grasses of Oklahoma, H. I. Featherly (*Oklahoma Sta. Tech. Bul. 3 (1938), pp. 132, figs. 134*).—This manual of grasses of Oklahoma comprises descriptions, often with illustrations, and indicated distributions and economic value of the 235 species and varieties of grasses found to occur in the State, with appropriate keys to the tribes, genera, and species. The work also includes a glossary, a bibliography, and an index to genera.

Seeding grasses on Utah dry farms, R. H. Walker and A. F. Bracken (*Utah Sta. Circ. 111 (1938), pp. 11, figs. 6*).—Grasses well suited for conditions on Utah dry farms include crested wheatgrass, slender wheatgrass, western wheatgrass, smooth bromegrass, and tall meadow oatgrass, for which seed is available. Bluebunch wheatgrass and mountain bromegrass are also good grasses, but seed is usually not available on markets. Based largely on station research, characteristics of these grasses are summarized with advice on seedbed preparation, time, method, rate, and depth of planting these grasses and alfalfa and sweetclover, also adapted to the better Utah dry lands, and on the care of new seedings. Methods of planting and harvesting grass for seed production and seeding abandoned fields and depleted range lands are also outlined briefly.

Artificial drought tests of some hay and pasture grasses and legumes in sod and seedling stages of growth, H. K. Schultz and H. K. Hayes. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 8, pp. 676–682, fig. 1*).—Results of tests of a series of forage grasses and legumes grown under field trials at the station and substations in 1936–37 for drought resistance in an artificial drought machine show very good agreement with those obtained under field conditions. Crested wheatgrass and bromegrass proved most drought resistant in both tests, while alfalfa was most drought resistant among the legumes.

A survey of pasture experiments now being conducted in the humid regions of the United States, H. R. Smalley and A. L. Grizzard (*[Washington, D. C.]: Natl. Fert. Assoc., 1938, pp. [3]+145*).—Pasture projects covering experiments currently in progress in 35 States by State experiment stations and the U. S. Department of Agriculture are outlined.

Establishing improved pastures in the Coastal Plain of Georgia. (Coop. U. S. D. A.). (*Georgia Coastal Plain Sta. Circ. 6 (1936), pp. [14], figs. 19*).—A preliminary report is made on cooperative experiments showing that introduced grasses and legumes, i. e., carpet and Dallis grasses, common lespedeza, and white clover, replacing native grasses including wire grass, broomsedge, tickle grass, bull grass, smutgrass, and crabgrass, together with drainage and removal of worthless trees and undergrowth, provide conditions for satisfactory lowland pasture with superior carrying capacity. For upland pastures, Bermuda grass and lespedeza in combination and kudzu alone furnish good pasturage. Instructions on clearing and drainage, fertilizers, seeds mixtures, and planting practices are outlined briefly.

Response of permanent pastures to lime and fertilizers [1930 to 1936], R. R. Robinson and W. H. Pierre. (Coop. U. S. D. A.). (*West Virginia Sta. Bul. 289 (1938), pp. 48, figs. 10*).—Effects of top dressings of lime and fertilizers on the botanical composition of pasture and on yield and chemical composition of clipped herbage were studied on seven permanent pastures (E. S. R., 78, p. 331) situated on different soil types and all but one supporting a poor type of vegetation and unproductive.

The lime and fertilizer increased the percentages of desirable plants, particularly Kentucky bluegrass and white clover and materially decreased the percentages of weeds, poor native grasses, and bare ground. The rapidity of the changes in vegetation was influenced by seasonal conditions and use of nitrogen fertilizers. Increase in percentage of white clover from the lime and phosphorus treatments was found closely related to the acidity and available phosphorus content of the soils. Under average conditions, the soil should be limed to at least pH 5.8, and its available phosphorus content should be at least 20 lb. per 2,000,000 lb. of soil for good pasture.

Average yield increases from lime and superphosphate varied from 38 percent on relatively fertile Huntington silt loam to 87 percent on Upshur clay loam. Generous use of complete fertilizer in addition to lime raised the increase in yields to as high as 227 percent on the Upshur soil. Yield increases from the treatments also were affected by the season and presence of white clover. When considerable clover was present, large increases in yield were obtained from superphosphate and lime, and on Dekalb soil from potash. Relatively small increases came from nitrogen fertilizers except when clover was absent. As reported earlier (E. S. R., 77, p. 776), lime and superphosphate materially increased the protein, calcium, and particularly the phosphorus content of the herbage. The prolonged residual effects of lime and superphosphate emphasized the importance of considering costs of pasture fertilization and liming as a long-time investment.

In general, the most profitable returns on West Virginia pastures may result from use of superphosphate and lime, particularly on unproductive soils with a high potential yielding capacity, i. e., soils acid and low in available phosphorus but not droughty, badly eroded or on very steep slopes. Potash also may be profitable on some soils. Nitrogen fertilizers in addition to lime and superphosphate may give profitable returns, especially on a dairy farm, if the extra pasture can be utilized efficiently, but need not be used where there is a good stand of white clover.

The significance and technique of dry matter determinations in yield tests of alfalfa and red clover, F. S. Wilkins and H. L. Hyland. (Coop. U. S. D. A.). (*Iowa Sta. Res. Bul. 240 (1938), pp. 313–351*).—Observations and conclusions from tests made during four seasons, 1930–33, in efforts to solve certain problems in water and dry matter determinations in research with alfalfa and red clover may be summarized as follows:

Differences in the water content of green forage of lots of alfalfa and red clover were found too small to be measured with the planting scheme used, but might have been determined more accurately with random distribution of small plats in small blocks, uniform growing conditions, and several replications. Water content of the forage of each lot varied with location and was measured fairly accurately on individual plats by taking either two or three samples per plat, yet yield determinations would have been about as accurate on a green weight basis without sampling. Either two or three samples per plat were needed to measure accurately the water content of forage on individual plats, and samples of from 2 to 4 lb. were considered best.

Freshly cut forage evidently should be sampled and weighed as soon as possible, since standing forage is more uniform in water content than at any time after cutting. With ideal conditions for field drying, forage lost significant amounts of water within 4 min. when exposed in the swath, after 6 min. from bunched forage, and after 3 min. from bagged samples. Alfalfa forage was 2.32 and 2.25 percent lower and red clover forage 3.65 and 3.84 percent lower in water content at 1:30 p. m. and at 5 p. m., respectively, than at 8 a. m. The difference between species was attributed largely to differences in weather conditions at sampling.

When wire bottom trays and large and small cloth bags contained 3- and 5-lb. samples partly dried with temperatures ranging from 40° to 88° C. in steam-heated driers the first containers and the higher temperatures, resulting in most rapid drying, gave slightly the highest dry matter determinations. Under ideal conditions air drying in tray and onion bag (wide mesh) containers gave determinations like those for drier dehydration, yet molding has occurred often in cloth and burlap bag containers in normal seasons. Dried material shook out of onion bags not handled carefully.

Forage partly dried to 30 percent water or higher at 80° lost dry matter when piled in a room just afterward to air-dry but not when reduced to 27 percent water or less before air-drying. Delayed-drying studies suggested that samples should be placed in the drier not later than the end of each half-day of harvesting, and bags should be large enough to avoid packing forage. Samples dried to about 2.5 percent water as soon as taken lost small but significant amounts of dry matter during laboratory storage for 1 or 2 mo. Probably as reliable dry matter determinations could be made with composite as with individual oven determinations, after partly dehydrating unchopped samples to about 2.5 percent water or less, in driers heated to about 80°. Water absorption by forage after desiccation indicated that samples should be weighed as soon as removed from the drier and oven to avoid appreciable error.

Some factors influencing the sulfur content of alfalfa, R. J. Evans and J. E. Greaves. (Utah Expt. Sta.). (*Utah Acad. Sci., Arts, and Letters, Proc., 14 (1936–37), pp. 17–22*).—The total sulfur content of alfalfa varied with the available sulfur in the soil and was influenced by variety of alfalfa, but neither seemed to affect organic sulfur content. Time of harvest was a still greater factor. French alfalfa contained the highest percentage of total sulfur and South African and Ladak (South Dakota) alfalfas the lowest. A significant difference was shown between strains of the same variety. Crude protein and organic sulfur in alfalfa were highly correlated. See an earlier note on wheat (E. S. R., 78, p. 189).

Barley production in Oregon, D. D. Hill, D. E. Stephens, D. E. Richards, R. E. Hutchison, and J. F. Martin. (Coop. U. S. D. A.). (*Oregon Sta. Bul. 355 (1938), pp. 34, figs. 7*).—Varieties, cultural methods, and field practices are indicated for growing barley in the different producing regions of Oregon, and information is given on the status of the crop, its adaptations, place in rotations, and diseases, and the relative yields, composition, and malting value of varieties under test.

The barley crop in Oregon, averaging over 2,000,000 bu. from around 75,000 acres, has remained fairly constant during 35 yr., although shifts occurred in producing areas notably from the Columbia Basin to the Willamette and northern coast region. Widely adapted in the State, barley is used most extensively as a feed grain good for all classes of livestock, but is also cut for hay in the drier sections, grown with legumes for hay or silage where moisture is sufficient, and is the best of small grains as a nurse crop for legumes and as a green manure and cover crop on adapted soils in western Oregon. Of the higher yielding varieties, Hannchen produces a good quality of malt and yields a higher percentage of extract than most malting barleys. Oregon barleys have tended to be slightly lower in diastatic activity than malting barleys grown in the main producing areas of the United States.

The Michelite bean, E. E. Down and J. W. Thayer, Jr. (*Michigan Sta. Spec. Bul. 295 (1938), pp. 23, figs. 6*).—Michelite (Mich′-a-leet), a new white navy bean first released for commercial production in 1937, was derived from a cross between Early Prolific, an excellent white bean, and the productive disease-resistant Robust white navy bean (E. S. R., 49, p. 32; 55, p. 529). The Michelite bean combines the resistance to mosaic and to field infection of bacterial blight or wilt and vigorous productivity of Robust and the uniformity in size and shape and glossy white seed coat of Early Prolific. It blooms from 2 to 4 days earlier, but often ripens no earlier than Robust. Michelite generally has a lower percentage of culls and yields as well as Robust and is superior in quality and appearance. The development of Michelite; its resistance to bean mosaic, blight, and wilt; percentage of culls; and comparative yields in station and over-State tests are described in some detail.

Facts about cotton (*U. S. Dept. Agr. Leaflet 167 (1938), pp. 8, figs. 25*).—Production, marketing, and utilization practices for cotton and cottonseed are described briefly and illustrated. The main uses of these commodities are listed.

A promising wilt-resistant long staple cotton, D. C. Neal and C. B. Haddon. (U. S. D. A. and La. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 8, pp. 644–646, figs. 2*).—A selection of Delfos cotton (Delfos 2323–965–425) made at St. Joseph, La., in 1934 exhibited marked resistance to fusarium wilt in tests 1935–37 on heavily-infested wilt plats. It produced over 1,100 lb. of seed cotton per acre on bluff soils at Baton Rouge, and 2,246 lbs. at St. Joseph in 1937.

Cotton: Land preparation, planting, and cultivation, compiled by E. E. Gross (*Mississippi Sta. Bul. 323 (1938), pp. 40*).—Information compiled from reports of experiments by State experiment stations and the U. S. Department of Agriculture covers seedbed preparation, seed treatment, planting, spacing, and cultivation.

A compilation of experimental data on cotton fertilizers applicable to the hill sections of Mississippi, E. E. Gross (*Mississippi Sta. Bul. 321 (1938), pp. [1]+94*).—A revision and enlargement of Bulletin 309 (E. S. R., 74, p. 774).

Yield trials with fall-sown oats at the Piedmont Branch Experiment Station Farm, Statesville, N. C., 1925–1938, G. K. Middleton, W. H. Chapman, and P. H. Kime (*North Carolina Sta. Agron. Inform. Circ. [112], (1938), pp. 4*).—Lee oats led consistently throughout the period, being outyielded during the last 5 yr. only by Winter Fulghum 2500 and by Lee Strain No. 5, selected from Lee.

Rice culture in the Southern States, J. W. Jones, J. M. Jenkins, R. H. Wyche, and M. Nelson. (Coop. La. and Tex. Expt. Stas. and Univ. Ark.).

(*U. S. Dept. Agr., Farmers' Bul. 1808 (1938), pp. II+29, figs. 20*).—Cultural and field methods, varieties, irrigation, harvesting, and threshing practices involved in rice production in the Southern States are described, and information is provided on the history and status of the crop and its adaptation, production costs, control of diseases, insects, and weeds, and the milling and utilization of rice. This publication supersedes Farmers' Bulletin 1092 (E. S. R., 43, p. 139).

Sugar cane collecting in New Guinea during 1937, C. G. LENNOX (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *42 (1938), No. 4, pp. 233, 234, 235–246, pl. 1, figs. 6*).—Findings of the expedition sent into the mandated Territory of New Guinea by the Sugar Planters' Association in 1937 are described, with a résumé of likely centers of origin of the various sugarcane species and details of the history of previous cane collections in New Guinea.

Symptoms on field-grown tobacco characteristic of the deficient supply of each of several essential chemical elements, J. E. MCMURTREY, JR. (Coop. Md. and N. C. Expt. Stas. et al.). (*U. S. Dept. Agr., Tech. Bul. 612 (1938), pp. 31, pl. 1, figs. 17*).—The distinctive deficiency effects of N, P, K, Mg, Ca, B, S, Mn, and Fe on the field-grown tobacco plant are described and illustrated from observations over 20 yr. in producing areas in connection with nutritional studies, checked by systematic experiments at Upper Marlboro, Md., and employing methods like those noted earlier (E. S. R., 71, p. 472). One series involved the same salts used in solution culture studies previously reported (E. S. R., 69, p. 362).

One group of deficiency symptoms includes those due to lack of N, P, K, and Mg, which seem readily mobile in the plant and are localized on the older leaves or rather general on the plant. The other group comprises those due to lack of Ca, B, Mn, S, and Fe, relatively immobile and localized on the terminal growth consisting of upper or bud leaves.

Local effects, as chlorosis of the older leaves with or without necrotic spots, are due to potassium or magnesium shortage. Potassium hunger differs from magnesium deficiency in development of small necrotic spots at tips and margins of chlorotic leaves. General effects on the plant as a whole with development of a light-green color represent nitrogen deficiency in contrast with a dark-green immature plant characteristic of phosphorus shortage. Drying up of lower leaves also following in nitrogen shortage is not commonly seen in the field when phosphorus is deficient.

Boron and calcium deficiencies finally result in a dieback of terminal growth but differ in the early stages. Calcium shortage first appears in a light-green color, followed by a typical hooking downward, with necrosis at leaf tips and margins. Boron deficiency is first evident in a light-green color followed by break-down at the base of bud leaves, which may grow later, making a distorted or twisted leaf. Leaves on plants lacking boron break easily, and the vascular tissue shows a black color.

The chlorotic effects on terminal growth or young leaves, not followed by complete break-down, typify manganese, iron, and sulfur deficiencies. Chlorosis characterizing lack of available manganese tends to follow out the minutest branches of the vascular system, giving the leaf a checkered effect, and is accomplished by a necrosis consisting of small spots scattered over the leaf, not seen in chlorosis due to iron and sulfur shortage. Iron chlorosis is typical only of tissue between veins, but the entire leaf in extreme cases becomes white or yellow. Sulfur shortage appears as a loss of green color on the upper leaves, but the veins are lighter green than tissue between veins or of the same color, although not white or yellow.

A key based upon the foregoing contrasted effects is included to aid in determining deficiencies under field conditions. When more than one element is deficient, growth may be greatly reduced but the evident symptoms are commonly those typical for the element most deficient under the conditions.

Tobacco fertilizer recommendations for 1939, C. B. WILLIAMS ET AL. (Coop. U. S. D. A. and Va., S. C., Ga., Fla., and Tenn. Expt. Stas.). (*North Carolina Sta. Agron. Inform. Circ. 111* (*1938*), *pp.* [*5*]).—Formulas, rates per acre, and sources of plant foods are recommended for fertilizers for flue-cured, sun-cured, and shipping tobacco, and for plant beds on tobacco soils in North Carolina, South Carolina, Virginia, Florida, and Georgia.

The relation of lignification of the outer glume to resistance to shattering in wheat, O. A. VOGEL. (U. S. D. A. and Wash. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, *30* (*1938*), *No. 7*, *pp. 599–603*, *fig. 1*).—The breaking point of the outer glume of a wheat spikelet when broken off was between 0.1 and 0.2 mm above the inside base. The proportion of lignified tissue in the glume base was about the same in the early dough stage as at maturity. Areas of greatest lignification were near the edges of the glume base; this seemed important because the edges are broken first when the glume is forced outward. Varieties more resistant to shattering were found to have the greater proportion of lignified tissue at the breaking point of their outer glumes. Longitudinal sections showed that the lignified band at the inner epidermis did not continue above the breaking point so prominently in varieties susceptible to shattering as in resistant wheats. Enlargement of the kernel in a spikelet during the dough stages often caused a buckling at the breaking point of the outer epidermis of one or both glumes, which may explain the fact that in a wheat spike outer glumes of spikelets containing very plump grains often are removed more easily than from spikelets with smaller kernels. It is concluded that a direct measurement of the tenacity of mature glumes would be a better determination of shattering resistance than the measurement of lignification.

Wheat: Its milling and baking quality, R. H. HARRIS (*North Dakota Sta. Circ. 62* (*1938*), *pp. 28*, *figs. 20*).—The factors responsible for quality in wheat and the need for and methods of measuring milling and baking quality are accorded popular discussion, with special attention to physical tests of flour quality, protein and baking tests, chemical studies on gluten and starch, diastatic and proteolytic enzymes, fats of wheat and flour, and application of such research and determinations to practical problems. Progress on the merits of durum wheats for macaroni also is mentioned.

Factors which influence the protein of hard red spring wheat, R. H. HARRIS (*North Dakota Sta. Bimo. Bul.*, *1* (*1938*), *No. 1*, *pp. 10–12*).—Climatic conditions, tillage and fertility, especially as to soil nitrogen, soil moisture, variety, and length of growing season are discussed as factors affecting protein content in this wheat class, with comments on flour quality.

Selenium and Tenmarq wheat, A. T. PERKINS and H. H. KING. (Kans. State Col.). (*Jour. Amer. Soc. Agron.*, *30* (*1938*), *No. 8*, *pp. 664–667*, *fig. 1*).—When Tenmarq wheat was grown on Derby soil in the greenhouse and not allowed full winter dormancy, early germination was aided by light applications of selenium; early growth (fall) was depressed by selenium, the depression varying directly with the amount applied; applications of 6 p. p. m. and more killed the wheat, the earlier death resulting from the heavier application; while applications up to 2.5 p. p. m. stimulated spring growth and harvest weight.

Laboratory tests of field crop seeds as indicators of seeding value, E. L. ERICKSON and R. H. PORTER. (Coop. U. S. D. A.). (*Iowa Sta. Res. Bul. 239* (*1938*), *pp. 273–312*, *figs. 5*).—Germination studies were made, 1934–37, with seeds of soybeans, sorghum, alfalfa, and clovers to determine the merits of laboratory tests for viability as an index of field germinations and the extent to which seeding rates of red clover, alfalfa, and sweetclover could be based on laboratory tests, the field value of their hard seeds, and their relative field stands when planted in basic and acid soils.

The laboratory germination of 95 samples representing 12 soybean varieties was higher and more uniform in autoclaved sand or soil at from 30° to 32° C. than on blotters in a high humidity chamber at from 20° to 30°. Field germination varied widely in some tests, largely because of variations in temperature, planting time, and soil moisture, and usually was lower than in the laboratory. A close relationship between laboratory and field germination was observed in 7 of 9 field plantings. There were indications, however, that occasionally laboratory germination in soil may not represent maximum viability.

Germination of sorghum seed representing 50 lots in autoclaved soil at from 20° to 30° in 5 days exceeded that between blotters in 6 days at from 20° to 30°, but was only slightly higher in 10 days.

Laboratory germination of most samples of alfalfa, red clover, and sweetclover with few or no impermeable seeds was reasonably indicative of field germination. Percentage germination of alfalfa and red clover in the field was more than half of that in the laboratory and of sweetclover about half. Impermeable seeds accounted for an increase in field germination of most samples ranking differently in the field. The maximum field germinations of impermeable seeds of alfalfa, red clover, and sweetclover were 55.4, 11.2, and 16.4 percent, respectively, in soil slightly acid in reaction, and the largest increases in field stand resulting from impermeable seeds in laboratory samples were 124, 27, and 112 percent, respectively. Samples with high contents of impermeable seeds gave higher stands than those having few or no impermeable seeds.

Alfalfa, red clover, and sweetclover low in hard seed content, planted at a rate adjusted according to an index value based on purity×percentage germinable seed, produced uniform stands. Seeding rates of one-half and one-fourth the adjusted rate resulted in corresponding reductions in stand. Laboratory tests of clovers and alfalfa evidently may serve as indicators for seeding rates if allowance is made for impermeable seeds.

Commercial samples of alfalfa, red clover, alsike, and Korean clover, each low in hard seed, germinated higher and sweetclover seed slightly less in acid than in basic soil. It was thought possible that differences in fertility or in physical condition were equally as responsible for germination differences as were differences in reaction.

Agricultural seed, A. S. Lutman (*Vermont Sta. Bul. 441 (1938), pp. 14*).—Purity and germination guaranties and variations therefrom are tabulated and discussed from tests of about 550 samples of agricultural seed collected from dealers in Vermont during 1938.

Control of mesquite and noxious shrubs on southern Arizona grassland ranges, R. B. Streets and E. B. Stanley (*Arizona Sta. Tech. Bul. 74 (1938), pp. 467–497, figs. 13*).—Velvet mesquite (*Prosopis velutina*), which has spread into some of the best grassland ranges in southeastern Arizona and reduced the carrying capacity, has not been controlled successfully by cutting alone, as the stumps sprout promptly and form dense clumps worse than the original tree. Control of mesquite on grassland ranges rather than eradication is suggested on account of its value as spring forage. The expense and labor of eradicating mesquite, burroweed, snakeweed, or other undesirable plants seemed to be justified only on grassland ranges where palatable grasses and forage plants are certain to take their places.

Experiments involving different chemicals variously applied and torching showed that only two methods, involving sodium arsenite and kerosene, respectively, were suitable in effectiveness, economy, and ease of application for general use on ranges. In the first method, sodium arsenite is applied to the sapwood by frilling the base of stump or tree with downward ax strokes. The poison is rapidly absorbed by the root system in quantities sufficient to kill. Where enough mesquite was cut to produce 50 cords of wood, the cost for poisoning stumps was for poison and labor 10 ct. each per cord. This treatment was cheaper and more certain to kill than other methods, and was about equally effective any month in the year. It also is adapted to and has proved successful for killing of unwanted trees in city and country yards and along fence rows and ditches. Spraying kerosene at the rate of 1 pt. to a 5-in. trunk to a height of 2 ft., holding the nozzle close to saturate the bark, preferably in June, proved very effective in some cases, but is not recommended without reservation.

Preliminary experiments on control of burroweed (*Aplopappus fruticosus*) and snakeweed or broomweed (*Gutierrezia sarothrae*), unpalatable perennial shrubs more or less poisonous to livestock, which likewise are spreading into the better grassland ranges, indicated that these xerophytes are unusually resistant to sprays, that grubbing is effective but impractical where plants or seedlings are abundant, and that torching of scattered plants or careful broadcast burning of patches is the most effective control method. Snakeweed was observed to be controlled partly but not eradicated by two insect enemies and severe drought, and seedlings of burroweed died in drought periods.

Control of leafy spurge by sheep grazing, E. A. Helgeson and E. J. Thompson (*North Dakota Sta. Bimo. Bul., 1 (1938), No. 1, p. 14, fig. 1*).—This is an abstract of a report previously noted (E. S. R., 80, p. 45).

HORTICULTURE

[Horticultural studies by the Utah Station] (*Utah Sta. Bul. 282 (1938), pp. 93–101, figs. 6*).—In this résumé of the first half-century of research, the results are discussed of experiments on tomato varieties, use of hotbeds in growing plants, breeding and storage of onions, improvement of celery, testing of fruit varieties, pollination and breeding of the cherry, pruning of fruit trees, fruit harvesting and maturity studies, irrigation of orchards, and autumn control of chlorosis in the Concord grape by grafting on vinifera roots.

Some ecological factors affecting vegetable varieties in southwest Texas, L. R. Hawthorn. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 690–692*).—Stating that most of the vegetable varieties grown in southwest Texas were developed elsewhere and are often ill-adapted to the prevailing day length, temperature, and relative humidity, the author discusses the performance of various species. Only a few onion varieties prosper because the days are too short to induce proper bulbing. Tomatoes failed to set fruit in midsummer. Among plants that did well in summer were the Early Neopolitan sweet pepper, Henderson Bush and Jackson Wonder lima beans, watermelons, cantaloups, sweetpotatoes, and okra, and in the cooler seasons beets, mustard, cabbage, and parsley.

The role of minor elements in greenhouse vegetable production, I. C. Hoffman. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 514–517*).—The use of excessive amounts of lime to raise soils to approximately neutral has resulted in rendering certain substances, such as manganese and iron, relatively unavailable. The continued heavy cropping and watering of greenhouse soils resulted in deficiencies of certain elements. The killing of useful biotic forms during the process of steam sterilization was also a disturbing factor. As a result, certain well-defined deficiencies had been observed, such as manganese, magnesium, calcium, and iron. Magnesium deficiency had appeared chiefly on tomatoes. No well-defined deficiencies in copper, zinc, boron, or sulfur had been observed, and applications of these four elements had given no benefit, generally.

Growth of cabbage seedlings in sand culture, as affected by delayed application of nutrient salts, A. A. Dunlap. (Tex. Expt. Sta.). (*Plant Physiol., 13 (1938), No. 3, pp. 631–640, figs. 2*).—Delayed fertilization on the tenth day of seedlings growing in glazed crocks of washed sand with constant-level tray subirrigation resulted at the twenty-fourth day in much stockier plants of about the same fresh weight as those started in fertilized sand. The physiological reasons for the superiority of the delayed-fertilization group are discussed.

Alignment charts for muskmelon volumes, T. M. Currence and R. M. Brown. (Univ. Minn.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), p. 681*).—Charts were prepared for the volumes of three shapes of muskmelon fruits classified, roughly, as flat, round, and oval.

Southern versus northern-grown tomato plants, J. D. Hartman and E. C. Stair. (Purdue Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 682–685*).—Comparison of Indiana Baltimore plants grown in Indiana in hotbed, coldframe, and hotbed and coldframe, and in Georgia in the field showed no significant difference in subsequent yield that could be attributed to the origin of the plants. The condition of the plants when set in the field was more important than the locality where grown.

The effect on yield of hardening the tomato plant, E. P. Brasher and K. C. Westover. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 686–689*).—Two lots of Break O' Day tomato plants grown under identical conditions until May 1, when one was removed to the coldframe and the other retained in the warm greenhouse, were set in the field on May 11. The hardening treatment was described as gradual and not severe. All plants endured frosts in the field, although some leaves were damaged on the tender plants. However, both in early and total marketable yields the tender plants proved superior, indicating that even moderate hardening was actually detrimental.

The effect of boron on the respiratory behaviour of tomatoes, W. R. Phillips (*Sci. Agr., 18 (1938), No. 12, pp. 738–740, fig. 1*).—Measurements of the output of carbon dioxide from Bonny Best tomato fruits taken from plants supplied with nutrient solutions differing in their boron content indicated that boron had a significant effect on the respiratory activity of the harvested fruits. Boron in moderate amounts resulted in a steady, low respiration rate, apparently conducive to good keeping quality.

The influence of certain fertilizer materials and practices on the yield of watermelons, F. S. Jamison. (Fla. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 678–680*).—The addition of magnesium (either as part of kainite or as magnesium sulfate) to fertilizer used for watermelons failed to prove of any benefit, and the kainite had a depressing effect upon the yield of U. S. No. 1 melons. Side dressings of nitrate of soda or of nitrate of potash decreased the number of No. 1 melons per acre, but the melons averaged somewhat heavier in weight.

Fruit growing in North Dakota, O. Grottoden (*North Dakota Sta. Bimo. Bul., 1 (1938), No. 1, pp. 12, 13*).—This is a brief discussion of the status of fruit production in North Dakota, with suggestions as to varieties, etc.

Pre-introduction testing of new fruit varieties, W. H. ALDERMAN. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 1–4*).—Discussing the important role taken by State and Federal research agencies in the development of new fruits, the author presents a synopsis of a systematic testing plan now followed in Minnesota in order to avoid dissemination of mediocre material.

Synthetic growth substances in the rooting of softwood cuttings of deciduous fruits, K. D. BRASE. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 431–437*).—A total of over 2,600 softwood cuttings of sour cherry, apple, pear, and *Prunus tomentosa* after treatment with synthetic substances were grown in equal parts of peat moss and washed sand. Different species and varieties within a species responded differently to treatment with indolebutyric acid, indicating the need of careful trials with each plant material. The inability to produce roots was not overcome by chemical treatment, but plants which would root under favorable conditions rooted much more freely after treatment. In the Montmorency cherry, softwood cuttings taken shortly before the shoots had become completely woody responded favorably to the indolebutyric acid treatment.

Improvements for stock testing to make the results more comprehensive, F. B. LINCOLN. (Univ. Md.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 426–430*).—The author points out the need of coordination of methods of testing fruit stocks and presents various constructive suggestions leading to such a program. Standards of performance may be set up for each important variety so as to give a definite indication of how nearly a variety is approaching its best performance in any given trial. The need of thorough testing of unworked stocks is stressed.

The wild fruit trees of the Caucasus and Turkestan: Their potentialities as rootstocks for apples and pears.—I, A first report on some wild quince from the Caucasus, H. M. TYDEMAN (*East Malling [Kent] Res. Sta. Ann. Rpt., 25 (1937), pp. 103–116, pls. 2*).—Seedlings raised from seeds collected from six wild trees growing in the Caucasus region are described and grouped according to types. After stooling, certain seedlings were budded with Conference, Dr. Jules Guyot, and Marie Louise pears, the last two because of their recognized incompatibility with the quince. The results, in general, accorded with expectations, the new quince stocks being, on the whole, no more promising than selected quinces now in use. There were, however, indications of differences in compatibility among the different seedlings. The inherent vigor of the seedlings showed little if any correlation with the vigor of the scion, at least in its initial year.

The influence of different pollens on the growth and development of the fruit in apples and pears.—I, A progress report on experiments carried out during 1937, H. M. TYDEMAN (*East Malling [Kent] Res. Sta. Ann. Rpt., 25 (1937), pp. 117–127, pl. 1, figs. 2*).—Measurements of the fruits resulting from 18 apple and 14 pear crosses showed comparatively large differences in size during the first few weeks after pollination. At maturity these differences in size had mostly disappeared due, apparently, to the dropping of the smaller fruits, but differences in final weight between any single variety differently pollinated approached 10 percent in certain cases. Rather large differences were observed in average seed content, but it did not always follow that the larger fruits had more seeds.

Commercial hand pollination of apples in Washington, F. L. OVERLEY and E. L. OVERHOLSER. (Wash. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 39–42*).—Stating that in 1937 over 1,000 acres of apples in the

Wenatchee and Yakima districts were hand pollinated by the growers, the authors report that hand pollination of Delicious flowers in an orchard where the set had been low for several years resulted in an increased set despite the presence of hives of bees. Similar results were secured in another Delicious orchard of fair productivity. Here the set was increased even when only one flower in every tenth cluster was pollinated by hand. In a normally heavy-producing Delicious orchard the set was also improved by hand pollination. Good results were secured with Winesap trees.

Effect of spray materials applied in the blossoming period upon set of fruit of Grimes and McIntosh apples, L. J. Doud and M. McCown. (Purdue Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 36–38*).—The significant reductions observed in the set of Grimes Golden apples from open blossoms of thinned clusters atomized with 2–6–100 bordeaux mixture were not recorded when weak bordeaux mixture or wettable sulfur was applied by means of a power sprayer to unthinned clusters. A tendency was noted toward an increased reduction as the time of spraying was advanced. No russeting attributable to the use of weak bordeaux mixture or wettable sulfur was noted. The authors conclude that spraying with weak bordeaux mixture or wettable sulfur in the first half of the blooming period is only slightly hazardous and is often necessary for control of fire blight and scab.

Spray residue on apples in New Mexico, C. W. Botkin and G. R. Hamiel (*New Mexico Sta. Bul. 258 (1938), pp. 15*).—Working with fruit obtained from the college orchards (where planned spray schedules were followed) and also from growers in different parts of the State, it was found that the amount of arsenical residue at harvest was, in general, proportionate to the number and the lateness of the arsenical sprays. None of the samples with one arsenical spray exceeded the tolerance limit, but 15 percent of the samples from trees sprayed twice with arsenicals did exceed the tolerance. Washing fruit with hydrochloric acid (from 0.5 to 1.5 percent), when properly done, gave satisfactory results. No significant correlations involving arsenical residues were observed as related to climatic differences in the various apple-producing areas of the State. Both cider and vinegar made from uncleaned apples exceeded the food tolerance for arsenic trioxide, suggesting the need of washing fruits designed for cider making. The use of nonpoisonous materials in the latter portion of the spray schedule was investigated and suggested that modified programs may be followed provided they give adequate insect control.

Notes on some apple crosses, H. P. Gould. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 5–8*).—Among parents used was the Australian variety Granny Smith, which, however, seemed to impart a lack of resistance to disease and unattractive appearance. The Winesap × McIntosh cross was most promising with respect to attractive appearance and good quality of the fruit and was comparatively free from the diseases of the tree.

Layering of root grafts—A ready method for obtaining self-rooted apple trees, F. B. Lincoln. (Univ. Md.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 419–422, fig. 1*).—The author describes a method of propagation found effective in the production of own-rooted apple trees. In 5 years' work with more than 75 clons which had been trench-layered, root development from the mother plants was very rare. Very little correlation was noted between the ability of a clon to produce burr knots and to develop roots from 1-yr. wood. It was easier to obtain roots from shoots of the current year than from older lignified tissue, and the easiest way to produce such shoots for layering was from root grafts.

Stock and scion relationships with reference to double worked apple stocks, T. J. Maney. (Iowa Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 390–392*).—Based on data accumulated over a period of approximately 25 yr., the author presents a list of stocks used successfully in top-working 45 different varieties of apple. Hibernal and Virginia Crab were exceptionally favorable stocks, being successful (one or the other or both) with almost all of the varieties. In a few cases, Virginia Crab gave peculiar reactions, acting, for example, as a dwarfing stock with some members of the Winesap family.

Cold hardiness of some apple understocks and the reciprocal influence of stock and scion on hardiness, N. W. Stuart. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 386–389*).—Relative hardiness, as determined by the electrical conductivity of exosmosed electrolytes after subjection of scion roots to freezing at 15° F., was found correlated with the known hardiness of the variety. In the material studied, Oldenburg stood at the top. The hardy roots contained slightly more sugar and less water than did the less hardy. All of the 25 varieties surpassed French crab seedlings in hardiness. Observations on trees worked on clonal roots indicated an appreciable influence of the scion on the hardiness of the rootstocks, yet the tenderest clonal roots were produced under Wealthy, the hardiest of the 4 varieties used. On the other hand, the hardiness of the scions was not measurably influenced by the hardiness of the stock during 1 year's growth in the nursery.

Studies in incompatibility of stock and scion.—II, The relation between time of budding and stock-scion compatibility, R. J. Garner and D. H. Hammond (*East Malling [Kent] Res. Sta. Ann. Rpt., 25 (1937), pp. 154–157, fig. 1*).—Continuing this series (E. S. R., 76, p. 792), Hale Early peach buds inserted at weekly intervals from June 24 to August 26 in two clonal rootstocks of Brompton (compatible) and Myrobolan B (incompatible) yielded trees typical of compatible and incompatible stock-scion combinations respectively. The time of budding exerted no significant effect on degree of compatibility.

Preliminary observations on the carbohydrate content of apple leaves on different rootstocks, E. R. Leonard (*East Malling [Kent] Res. Sta. Ann. Rpt., 25 (1937), pp. 173–180*).—Analyses of leaves taken from Lane Prince Albert trees budded on Malling XII (very vigorous) and Malling IX (very dwarfing) showed consistently higher dextrose and sucrose contents throughout the sampling period—October and early November—in the Malling IX lot. Starch content was low in the leaves of both stocks.

Observations on the abscission of the mature fruits of some apple varieties, M. McCown. (Purdue Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), p. 48*).—Study of abscission of mature Rome, Delicious, and Golden Delicious fruits indicated that this process is the result of changes in the pectic compounds, especially those in the middle lamella of the cell walls of the pedicel and abscission zone. The histological aspects of abscission are considered.

Experiments in sampling technique.—II, Size and colour of Allington Pippin, 1936 crop, T. N. Hoblyn and J. L. Edgar (*East Malling [Kent] Res. Sta. Ann. Rpt., 25 (1937), pp. 168–172, fig. 1*).—In continuation of this series (E. S. R., 73, p. 613), it was found by dividing the entire crop of 18 trees into samples of 40 apples each that with the usual replications it is necessary to grade only about one-eighth of the crop of each tree, selected at random from the whole, to secure reasonably accurate estimates of the average size and color.

Preliminary studies on the gas storage of McIntosh and Northwestern Greening, R. M. Smock and A. Van Doren. (Cornell Univ.). (*Ice and Refrig.,* *95 (1938), No. 2, pp. 127, 128, fig. 1).*—Using uniformly mature fruits stored in air-tight metal containers large enough to hold at least 1 bu., it was found that the modification of the storage atmosphere to contain 5 percent carbon dioxide and 2.5 percent oxygen was beneficial to the keeping of both varieties. With gas storage, a temperature of 40° F. proved more satisfactory than 36° with respect to preventing the development of brown core.

The effect of borax top-dressing on the storage quality of Jonathan apples, E. Chittenden and R. H. K. Thomson (*New Zeal. Jour. Sci. and Technol., 19 (1938), No. 9, pp. 541–546, figs. 2).*—Jonathan apples from trees supplied with 0.5, 1, and 3 lb. of borax failed to keep as well as apples from control trees. After 6 mo. at 38° F., internal break-down was greater, even in the 0.5 lb. per tree lots. Analyses showed an increased boron content in the fruits proportionate to the applications. One-half lb. of borax per tree is the maximum that can be used on boron-deficient soils without significantly lowering the keeping quality of the fruit.

Vegetative propagation of the blight-resistant Old Home pear, L. H. Day. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 423–425).*—One-year old trees of Old Home pear budded in 1-year-old rooted cuttings of quince were planted with the unions 4, 8, and 12 in. below the soil surface. At the end of 4 yr., two of the 12-in. trees had developed a good system of Old Home roots which apparently would dominate the quince roots in time. At 8 in. there were less pear roots, and at 4 in. there were only a few small pear roots.

Does the yearling whip reveal the potentialities of the best seedling stocks? F. C. Bradford and L. Joley. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 375–377).*—Working with young nursery pear trees with one and two scions, it was found upon removal of the extra whip that the development of two whips had not measurably retarded the growth of either in comparison with single whip trees. Apparently, the greater leaf surface on the double-stemmed trees had resulted in increased synthesis of foods, and the training to a single whip was apparently equivalent to pruning in its effects on the larger seedlings.

The influence of seedlings of four peach varieties upon the growth of scions, L. H. Day. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 383–385).*—Stating that seedlings of Muir, Elberta, Salway, and Lovell ranged in size in ascending order, the author reports that Phillips Cling budded on each of four seedling stocks differed but little in growth, and, in fact, the trees on Muir were the largest. Comparable results were obtained with various peach, plum, apricot, and almond varieties budded on the same four peach seedlings.

Germination and seedling vigor of peach varieties for understocks, F. E. Gardner and P. C. Marth. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 409–414).*—In search of seed stocks to replace the diminishing supply of "natural" seed, tests were made of the germination and comparative growth of open-pollinated seedlings of many peach varieties. In the 126 lots, germination varied from 0 in 10 kinds to 85.4 percent in Lemon Free. With 40 percent germination rated as a good stand, 24 exceeded this rating. In general, seedling growth was correlated with germination. The seedlings within a variety exhibited, for the most part, a notable uniformity. In general, freestones gave appreciably higher germination than did clingstones. A positive correlation was observed between ease of cracking the pits and germination. A number of varieties germinated better in the second season after planting than in the initial season.

Cross sterility in hybrid plum varieties, W. S. Flory. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 43-46*).—A presentation in tabular form of the results of over 15,000 pollinations involving 54 crosses among 16 varieties showed complete sterility in almost all cases. The maximum percentage of set, 8 percent, was secured in a Munson × Burbank combination. In 51 of the crosses at least one of the parents had *Prunus salicina* in its genetic make-up. The results showed the striking cross-sterility that exists between (1) the different *P. salicina* hybrids, (2) *P. hortulana* varieties and *P. salicina* hybrids, and (3) *P. salicina* and its hybrids. Of six varieties—Bruce, Excelsior, Methley, Nona, Omaha, and Yellow Iowa—Methley was the only one to set fruit (10.26 percent) upon selfing.

Orchard tests of mazzard and mahaleb cherry understocks, R. D. Anthony, R. H. Sudds, and G. E. Yerkes. (Pa. and W. Va. Expt. Stas. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 415-418*).—At Arlington Farm, Va., mahaleb stocks induced earlier and heavier fruiting than did mazzard but proved undesirable because of the death of trees within 10 yr., whereas most of the mazzard-rooted trees survived in good condition. Montmorency on mahaleb came into full bloom several days earlier than Montmorency on mazzard. At Kearneysville, W. Va., Montmorency on mahaleb stocks secured from Bell, Md., grew almost as well as on mazzard. At the same time, Montmorency on Washington State mahaleb stocks were much smaller, indicating differences in mahaleb. In another trial where Montmorency was budded on carefully matched mazzard and mahaleb, the mazzard-rooted trees were strikingly larger. At State College, Pa., Schmidt sweet cherry on mazzard suffered less loss from severe winters than did Schmidt on mahaleb. Montmorency and St. Medard sour cherries endured winters much better than did the sweets but responded differently to the several stocks. Montmorency grew equally well on Virginia mazzard and Bell mahaleb, while St. Medard grew better on Bell mahaleb than on Maryland mazzard. The results showed that mazzard is the better stock for sweet cherries, with indication that for Montmorency certain selected mahaleb stock may prove worth while.

Fruiting response of Eldorado blackberries pruned to varying lateral lengths with and without nitrogen fertilizer applications, W. H. Childs. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 489-491*).—The lateral branches of plants tipped to a height of from 24 to 30 in. were pruned the following spring to 4, 8, and 12 buds and full length. Certain plats in each pruning group were given 200 lb. of nitrate of soda in April. The nitrogen stimulated yields on all plats except the full-length lateral growth. The largest yields were secured where laterals were pruned to 12 buds and nitrogen applied, but the largest berries were picked from the 4-bud laterals on nitrogen plats. Except in the case of the nonpruned, nitrogen increased the proportion of early maturing fruit. The yield increase on nitrogen plats was due to larger berries and to either larger clusters or more clusters per plant.

Further observations on a chlorosis of the cultivated blueberry, J. S. Bailey and J. N. Everson. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 495, 496*).—As in 1936 (E. S. R., 78, p. 358), the greatest recovery was made by plants treated with ammonium sulfate. However, in 1937, peat and aluminum sulfate treatments were somewhat beneficial. Determinations of the iron in the soil beneath plants showed much more, particularly of soluble forms, beneath the healthy plants, indicating that iron deficiency was the cause of chlorosis. In nutrient cultures chlorosis was produced by the addition of lime.

Latham, Cuthbert, and June raspberries under hillrow and hedgerow training, G. Beach. (Colo. State Col.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 497–500*).—Comparison of hillrow and hedgerow culture of Latham, Cuthbert, and June red raspberries grown under conditions where winter burial of the canes was necessary showed no significant differences in yield in 1936 and 1937. The yield differences in favor of the hedgerow most closely approached significance in the case of Cuthbert. Except in one instance, the canes in the hills were larger in diameter but fewer in number. It was evident that canes produced in or near the main crown were the larger. There was a positive correlation between size of canes and yields.

Winter storage of strawberry plants, T. L. Aamodt and W. G. Brierley. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 504–507*).—Practical tests by nurserymen and one experiment conducted by the station showed the possibility of digging strawberry plants in late autumn before severe freezes occurred and storing them in unheated storage sheds or in a protected location where they could be well covered with straw. As a result of these treatments, winter injury to the roots was avoided and the plants were much more readily available for spring shipment or handling.

A study of the winter respiration of the strawberry plant, W. G. Brierley and R. H. Landon. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 480–482, fig. 1*).—Samples of Dunlap plants stored in peat in an outdoor frame that excluded snow and where the temperature of the peat reached a minimum of —3° C. (26.6° F.) were taken at repeated intervals throughout the winter in respiration studies in a control chamber where the temperature was held within ±0.5°. The rate of air flow was such that the chamber was emptied three times each hour. Although fluctuations in the carbon dioxide output occurred, there was noted a general downward trend from October 23 to April 1. The results suggested that no undesirable effects are likely to result from early mulching of strawberry beds, now advocated to avoid injury from severe early freezes.

Runner production of strawberry varieties, N. H. Loomis. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 508–510*).—Observations at Meridian, Miss., on the number and length of runners produced by 6 varieties, Blakemore, Klondike, Southland, Missionary, Dorsett, and Fairfax, and also on 15 unnamed selections showed marked differences in capacity to reproduce. Blakemore produced the most runners, with Missionary and Klondike next in order. These three produced runners long enough for 10-in. spacing. Some of the varieties did not produce sufficient runners to meet commercial needs, whereas Blakemore produced an excessive number. The range in length of mature runners in all varieties and seedlings varied from 2 to 21 in. Nearly all the varieties and selections produced runners more freely in summer.

Number and length of runners of strawberry varieties, E. B. Morrow. (Univ. N. C.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 511–513*).—Records taken on the same varieties grown at different locations showed, in general, that both the number and length of runners were greater at Swannanoa (2,250 ft. elevation) than at Willard (51 ft. elevation). Varieties differed sharply in the average length of the runners, with Missionary and Klondike producing relatively long, Blakemore and Fairfax medium, and Premier (Howard 17) and Dorsett relatively short runners.

Yield comparisons of everbearing strawberry varieties under different spacing treatments, I. C. Haut and A. L. Schrader. (Univ. Md.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 483–488*).—Observations on five varieties—Wayzata, Mastodon, Gem, Aiken, and Empire All Red—set in the early spring of 1935 at different distances showed in the 1935 autumn crop the greatest yield, irrespective of variety, where the double row hill system with mother plants set 11 in. apart and no runners permitted to form was utilized. Wayzata failed to produce sufficient runners to meet the needs of the experiment. Severe drought in the spring of 1936 interfered with results, but in plats where water was applied Mastodon showed marked superiority as a spring producer. Leaving the spacing plats intact but renewing the matted rows by harrowing, the highest yields were obtained in the matted rows in the fall of 1936 except in the case of Wayzata.

The influence of spacing strawberry plants on yield, E. P. Christopher and V. Shutak. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 501–503, fig. 1*).—The maximum yield of Howard 17 and Dorsett berries was secured with runner plants spaced 5.7 and 5.3 in. apart, respectively. Spacing of mother plants too far apart resulted in the necessity of using late-developed runners which were smaller in size and, most likely, less productive. Under the conditions of the study, mother plants spaced 18 or 24 in. gave the best results. The authors suggest that a spacing of from 6 to 7 in. would appear desirable on the type of soil used.

The relationship of leaf area and leaf area fruit ratios to composition and flavor of Concord grapes, N. H. Loomis and J. M. Lutz. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 461–465*).—Records taken on 20 vines in 1936 and 60 vines in 1937 showed a definite correlation between available leaf area and quality of the fruit. In 1937, of 26 vines with over 50,000 cm^2 of leaf area, the fruit of all except 2 rated at least good in color and flavor. Of 19 vines with from 20,000 to 50,000 cm^2 of leaf surface, there were fewer in the very-good class, but only 2 rated below good in both color and flavor. None of the vines with a leaf area of less than 20,000 cm^2 rated very-good in both color and flavor of fruit, and 10 were rated below good in these two characters. In 1937, Concord grapes with a solids-to-acid ratio below 55 were generally of poor quality. As to the influence of rootstocks, it was evident that several of the grafted vines were superior to own-rooted vines. It is believed that if vine vigor and foliage can be maintained, Concord grapes of good color and quality can be produced under southern conditions.

Growth substances with particular reference to subtropical fruit plants, H. P. Traub. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 438–442*).—The results are presented of extensive trials with a large number of plants and growth-promoting materials with special reference to the effect on such tissues as the stem, tendrils, leaves, and fruit. Cuttings made from grafts of citron, a ready-rooting species, on sweet orange, a difficult species, formed abundant callus but no roots, while sweet orange cuttings made no callus at all. Apparently, the factor for callus formation, but not that for root formation, was passed from the citrus to the orange.

Correlations between seed, seedling, and budling in the avocado, R. W. Hodgson and E. R. Eggers. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 372–374*).—Positive correlations were found between the weight of seed, size of seedling at time of budding, and size of the young budded tree, but the magnitude of the correlation coefficients was not sufficient to warrant consideration in relation to changes in commercial nursery practices.

Growing tung trees in south Mississippi, J. C. Robert and S. R. Greer (*Mississippi Sta. Bul. 322 (1938), pp. 11, figs. 8*).—Herein is presented general information on the planting, cultural care, and handling of the crop, supplemented by the results of certain investigations. In the absence of fertilizer applications, leguminous cover crops proved effective in increasing growth and yield, and, in general, the more organic matter plowed under, the greater the increments. In the absence of cover crops, fertilizers in the form of stable manure and nitrate of soda increased yields slightly. Cultivation was shown to be very important since the cultivated, nonfertilized plats yielded very well. Cultivation and fertilization apparently increased the resistance of the trees to low temperatures.

FORESTRY

Forest resources of northeastern Florida, F. A. Ineson and I. F. Eldredge. (*U. S. Dept. Agr., Misc. Pub. 313 (1938), pp. IV+40, pl. 1, figs. 10*).—Information is presented as to present supplies of timber and other forest products, the rate at which the supply is being replenished through growth, the rate of diminution through industrial and domestic uses, windfall, fire, diseases, etc., and present consumption and probable future trends. An effort is made to interpret and correlate the findings with existing conditions as an aid in formulation of both public and private policies for the effective and rational use of forest lands.

The development of natural reproduction in previously grazed farmwoods, D. Den Uyl, O. D. Diller, and R. K. Day. (Coop. U. S. D. A.). (*Indiana Sta. Bul. 431 (1938), pp. 28, figs. 23*).—Based on several years' intensive study (E. S. R., 71, p. 783), the authors conclude that the exclusion of livestock is the first step in the management of farmwoods in the better agricultural sections of the Central States. The rate of recovery was found dependent on the stage of decadence at the time the animals were excluded. Wooded areas of the open park stage were unable to make successful progress toward rehabilitation until species which could successfully invade the sod had reestablished conditions favorable to the germination and growth of the desirable species. The time required to progress from one stage of decadence to the next higher stage varied with the type of forest. It was most rapid in the wet upland type, followed closely by the beech-maple, and very slowly in the oak-hickory types. Soil moisture was evidently the most important limiting factor in the establishment and survival of natural reproduction. In the open park woodlands, during drought the soil moisture dropped below the minimum at which seedlings could survive. The responsible factors are high transpiration rate of the trees and of the bluegrass sod, the absence of leaf litter, increased light intensity, and wind movement. Silvicultural practices favoring natural regeneration in the transition and open park woods are discussed.

Breeding new chestnut trees, A. H. Graves. (U. S. D. A. et al.). (*North. Nut Growers Assoc. Proc., 28 (1937), pp. 93–100*).—This is a general summary of breeding work for higher quality of timber and nuts, hardiness, blight resistance, etc., with a list of some 21 new forms developed through cross-pollination of various chestnut species and hybrids.

Factors affecting establishment of Douglas fir seedlings, L. A. Isaac (*U. S. Dept. Agr. Circ. 486 (1938), pp. 46, figs. 19*).—Observations near Carson, Wash., showed that unfavorable site conditions, partly the result of broadcast slash-burning, caused an average loss of 80 percent of the annual seedling crop. Under full insolation there was practically no survival. About in the order listed, heat, drought, frost, and rodents were the major causes of loss, with insects, competition, and mechanical injury as supplements. Heat injury usually occurred at the soil surface, and newly germinated seedlings were injured by a temperature of 123° F. or killed at 125°. Shade from fallen logs and debris was more helpful than that from living weeds or shrubs because of noncompetition for water and nutrients. Drought should be the major cause of mortality, except that it generally occurs in the late season after the other destructive factors have operated. Rodents ate both seed and seedlings. Bare soil surfaces resulted in a lower soil temperature in the winter.

The use of fertilizer in the coniferous nursery, with special reference to Pinus resinosa, H. A. LUNT (*Connecticut* [*New Haven*] *Sta. Bul. 416* (*1938*), *pp. 721–766, figs. 6*).—In the case of red pine seedlings grown in tubs, there was noted a definite response to improved fertility conditions. In seedbed trials at Windsor and the Peoples Forest nursery, fertilizers in general gave beneficial results, with a distinct tendency for organic materials to be superior to inorganic. High concentrations of inorganics caused frequent injury and death. At Windsor, concentrations of high-analysis fertilizer in excess of 100 lb. of nitrogen per acre proved injurious. At Rainbow, because of the low buffer capacity of the soil, even 50 lb. of nitrogen was harmful. Fish meal gave beneficial results at the Peoples Forest nursery, but even when applied in amounts up to 3,200 lb. per acre did not produce outstanding responses. Red pine which had been fertilized in the nursery made in general somewhat better growth in the field than the unfertilized trees. Alternate-year fertilization in the field gave, over a 5-yr. period, a slight gain in growth. The author concludes that the kind and amount of fertilizer to be used should be determined by the quality of the soil, age of the trees, and to a certain extent by the species. Of the conifers grown, Scotch pine made the heaviest and Norway spruce the least demand on the soil for nutrients. Under the conditions, it was not possible to shorten the time required for plants to remain in the nursery.

Yield of even-aged stands of ponderosa pine, W. H. MEYER (*U. S. Dept. Agr., Tech. Bul. 630* (*1938*), *pp. 60, pls. 2, figs. 15*).—Yield, stand, stock, and height tables based on 450 plats scattered throughout the northern and western parts of the ponderosa pine range are presented. Another 400 or more plats were used in a study of the effect of grade of stocking on various yield characteristics. Stand and stock tables are offered for the region as a whole and for several subregions in which variations appeared to be significant. Among the yield tables are those for number of trees, basal area, average diameter, and cubic-foot volume for that part of the stand including trees 6.6 in. or more in diameter, as well as the part including trees 11.6 in. or more in diameter. For these partial stands, board-foot yield tables are also presented.

In the appendix the author points out that owing to the peculiarities of the data the standard methods of yield-table construction had to be modified in certain respects in order to secure satisfactory results. The data from the Black Hills region varied so greatly from the remaining data that a special study and separate yield tables are indicated.

DISEASES OF PLANTS

The plant Disease Reporter, October 15 and November 1 and 15, 1938 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 22* (*1938*), *Nos. 19, pp. 379–392, figs. 2; 20, pp. 393–409, fig. 1; 21, pp. 411–441, figs. 2*).—The following items are of interest:

No. 19.—Cotton rust (*Puccinia schedonnardi*) in Arizona, by J. G. Brown; tobacco diseases in Kentucky, 1938, by W. D. Valleau and E. M. Johnson; onion disease situation in Massachusetts summarized, by O. C. Boyd; peach yellows in Tennessee; *Colletotrichum graminicolum* on grasses in Maryland and Virginia, by C. L. Lefebvre and H. W. Johnson; semiarid climate of value in seed production, by H. P. Barss; and plant disease fungi and various molds associated with human disease.

No. 20.—Yellow-red virosis (X-disease) of peach and chokecherry, by E. M. Hildebrand and D. H. Palmiter; the keeping quality of cranberries in Massachusetts in 1938, by H. F. Bergman; Persian walnut and filbert diseases in the Pacific Northwest in 1938, by P. W. Miller; bacterial wilt of sweet corn in 1938, by C. Elliott; lodging of sorghum in Texas associated with *Sclerotium bataticola* infection, by A. A. Dunlap; *Phytophthora* crown canker of dogwood (*Cornus florida*), by D. S. Welch; diseases of fruits and vegetables on the New York market during the months from May to September 1938, inclusive, by C. O. Bratley and J. S. Wiant; and brief notes on "black pox" fruit spot of apples in Indiana, "weak neck" disease of sorghum in Kansas, and further spread of Dutch elm disease.

No. 21.—Late blight and other potato diseases in 1938—reports from various States, including New Hampshire, Vermont, Massachusetts, New York, New Jersey, Delaware, Maryland, Virginia, West Virginia, Ohio, Michigan, Wisconsin, and Minnesota; plant pathology in fiction; the reactions of introduced bean varieties to rust (*Uromyces phaseoli typica*) in Hawaii, by G. K. Parris—(Bean rust was first reported from the Hawaiian Islands in 1918, but apparently has never assumed serious proportions until recently. In 1937 it suddenly developed in epidemic proportions on the most widely grown variety, viz, Lualualei, on several of the islands. This race of bean rust was tested on 43 varieties in Hawaii and sent to L. L. Harter of the Bureau of Plant Industry for confirmatory tests. The Hawaiian rust is considered distinct from forms No. 1 and No. 2); *Botrytis* infection of onion leaves and seed stalks, by C. E. Yarwood; black pox fruit spot (*Helminthosporium papulosum*) of apples in Pennsylvania in 1938, by R. S. Kirby and A. H. Bauer; recovery from silver leaf (*Stereum purpureum*) of Montmorency cherries, by W. D. Mills; brief notes on strawberry diseases, including low stand of strawberry plants in eastern North Carolina, September 1938, and nonyellowing stocks of Blakemore strawberry; leaf rust on fall wheat in Oklahoma, by C. C. Brown; *Coleosporium vernoniae* on *Pinus rigida* in Illinois, by J. C. Carter; frost injury to woody plants in Illinois in May 1938, by J. C. Carter; distribution of popcorn disease (*Sclerotinia carunculoides*) of mulberry, by A. E. Jenkins and E. A. Siegler; and potato diseases in Minnesota, by J. G. Leach.

Botany and plant pathology (*Utah Sta. Bul. 282 (1938), pp. 61–68, 72, figs. 4*).—A résumé is presented of the station's work on psyllid yellows of potatoes; virus diseases of potatoes; *Fusarium* and *Verticillium* wilts, western yellow blight, mosaic, curly top, and bacterial canker of tomatoes; curly top of beans; sugar beet diseases, including wet root rot, dry rot canker, late blight, and black root; bacterial wilt of alfalfa; strawberry root rot; chlorosis of grapes and fruit trees; and injury to crops by smelter fumes.

Studies in antibiosis between bacteria and fungi, C. J. Alexopoulos, R. Arnett, and A. V. McIntosh (*Ohio Jour. Sci., 38 (1938), No. 5, pp. 221–234, pls. 2, figs. 2*).—The purpose of the study was to determine whether any of several common species (11) of bacteria could inhibit the growth of fungus species (10) in culture. Of the 3 bacteria, viz, *Serratia marcescens*, *Bacillus subtilis*, and *Actinomyces albus*, shown capable of such action, the last proved to be the most universal inhibitor. The more detailed study of its effect on *Colletotrichum lindemuthianum* appeared to establish the fact that the presence of living *Actinomyces* was not necessary, since sterilized filtrates of cultures produced similar inhibitory effects. It is believed probable that the antibiotic phenomena described are due either to the secretion of a substance by the bacteria which is toxic to the fungus, or to the production of such a substance by change in the medium through chemical reaction. The "toxin" was soluble in water, diffusable through agar, and at least to a large degree thermostable.

Experimental studies on the saltation in fungi parasitic on plants, I. HIROE (*Mem. Tottori Agr. Col., 5 (1937), No. 1, pp. 272, pls. 25, figs. 10; Eng. abs., pp. 241–272*).—This résumé of the author's 10-yr. study, with special reference to *Helminthosporium* and the related *Brachysporium*, leads him to conclude that permanent variations in fungi are due to hybridization or segregation, mixochimaera (heterocaryosis), "Dauer-modifikation," and mutation or saltation. In the case of sexual reproduction the first is said to be the main cause, and in asexual reproduction, the last. The permanent variations here detailed are based on saltation, which are placed in four groups according to type of saltation, and in three groups according to the characteristics of the saltants. Pseudo-myceliolysis is said to be due to certain metabolic products of the fungus, and it is claimed that certain island types of saltation are induced especially by enzymes or other substances in these products. The various types of saltation are discussed in detail.

Inactivation of seed-borne plant pathogens in the soil, A. W. HENRY and J. A. CAMPBELL (*Canad. Jour. Res., 16 (1938), No. 9, Sect. C, pp. 331–338*).—"Certain seed-borne pathogens are inactivated to a marked degree when infested seed is sown in natural soil. *Polyspora lini* and *Colletotrichum lini*, the fungi causing, respectively, the browning and anthracnose diseases of flax, are so affected, both when naturally and artificially infested seed is used. This appears to be due largely to the antibiotic action of the micro-organisms of the soil, since in sterilized soil similar seed produces significantly higher percentages of infection. Infection may be reduced as much or more by this means as by seed treatment with certain fungicides. On the contrary, some seed-borne pathogens apparently are not inactivated to such an extent as to produce consistently less disease in natural than in sterilized soil. This has been indicated by preliminary experiments with certain smut fungi, for example those causing bunt of wheat."

A technique for studying the longevity of Phoma lingam in the soil, J. G. GIBBS (*Phytopathology, 28 (1938), No. 10, pp. 762, 763, fig. 1*).—Incised swedes (rutabagas) steeped in aqueous suspensions of infected soil or *P. lingam* spores became dry-rotted within 10 days. The fungus persisted in the soil for at least 2 mo.

Relations between crown gall and pH of the soil, E. A. SIEGLER. (U. S. D. A.). (*Phytopathology, 28 (1938), No. 11, pp. 859, 860*).—In tests on soil inoculated with *Phytomonas tumefaciens*, 32 percent of the peach seedlings in limed rows became galled, whereas only 3 percent in the relatively acid parts of the plat were thus affected. While caution is advised until confirmatory results are at hand, it is deemed possible that adjustment of the pH of certain soils may also aid in controlling hairy root (*P. rhizogenes*).

Some physiological studies of crown gall and contiguous tissue, R. NAGY, A. J. RIKER, and W. H. PETERSON. (Wis. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *57 (1938), No. 7, pp. 545–555, figs. 4*).—From analyses of galls and contiguous tissues of tomatoes, raspberries, and sugar beets it was found that, in general, the composition of gall tissue resembles that of young plants, being high in nitrogen and low in fibrous material. In sugar beets, however, the galls proved more fibrous than the succulent host plant. The composition of galls and contiguous tissues varied greatly with time of harvest and plant species. The glutathione content of tomato galls was greater than in contiguous stems, but was much lower than in growing tips. More ascorbic acid was produced by the more metabolically active tissues. The pH of stems and galls of tomato tissues were about the same. The catalase, oxidase, and peroxidase activities on a wet-weight basis were 160, 130, and 120 percent greater, respectively, in tomato galls than in contiguous stem tissues, but on the basis of total nitrogen the figures for the galls were 86, 73, and 57 percent greater. Tomato gall extracts rapidly destroyed tyrosine, but a similar preparation from stems showed no such activity.

There are 36 literature references.

A method of measuring the relative resistance of varieties of tomato and bean to curly top, H. L. Blood. (Utah Expt. Sta.). (*Utah Acad. Sci., Arts, and Letters, Proc., 15 (1937–38), pp. 21–24*).—Considering the standard field plat technic unreliable where the inoculation depends on a migratory vector such as *Eutettix tenellus*, the author developed the following method which has proved fairly reliable in the 5 yr. under trial:

Seeds are drilled as soon as danger of frost is over, with care to obtain all the uniformity possible in an open-field experiment. At the primary leaf stage inoculations of an arbitrary number of plants of each selection begin by placing a given number of viruliferous insects on each plant. Additional groups of plants of each selection are inoculated each week for 3–4 weeks and then at biweekly intervals until eight inoculations have been made. For comparative weekly readings the cycle of disease development from incipiency to death is divided into five stages from healthy as stage 1 to complete death of the plant as stage 5. From the data thus obtained the weekly progress of the disease and the total seasonal response in the respective selections are obtained. A coefficient is presented which gives an idea of the relative resistance of the various selections.

Host-parasite relations of Sclerospora graminicola on species of Setaria, E. S. McDonough. (Iowa State Col. et al.). (*Phytopathology, 28 (1938), No. 11, pp. 846–852, figs. 2*).—In *Setaria italica* and *S. viridis* seedlings inoculated with germinating oospores of *Sclerospora graminicola*, infection took place through the mesocotyl, coleoptile, root, or coleorhiza, but apparently most often through the last. Direct penetration of epidermal cells was followed by some intracellular growth, but an intercellular mycelium with haustoria soon formed. Growth was directed toward the embryonic stem tip from which the mycelium entered the young leaves as they developed. A systemic infection was established before the mesocotyl had elongated to any extent.

The application of serological methods to the differentiation of closely related smut fungi, E. C. Beck (*Canad. Jour. Res., 16 (1938), No. 10, Sect. C, pp. 391–404*).—The results of two series of reciprocal precipitin-ring tests indicated that different genera and species of the Ustilaginaceae could be satisfactorily differentiated by this technic. So also were compatible cultures of the same species where no detectable differences existed other than the necessity of the haploid counterparts being brought together on the appropriate host plant to induce the diploid phase and subsequent infection of the host. A parent culture and its mutant, differing morphologically but alike in pathogenicity, were the only ones not differentiated by this method. Reciprocal absorption tests were applied to these two fungi, but the powder of either culture absorbed the antibodies of both from the immune sera. Optimum proportions of antigen and antibody were determined, but could not be applied in absorption tests because of the dilution of antisera. Attempted agglutination tests were unsuccessful.

Naucoria on small grains in Illinois, G. H. Boewe (*Phytopathology, 28 (1938), No. 11, pp. 852–855, fig. 1*).—Though but few previous reports of

Naucoria spp. on living plants have been found, the author observed (1935) one of these gill fungi, *N. cerealis* n. sp., fruiting on wheat, barley, and rye in widely separated parts of Illinois, with evidence that it is a mildly parasitic form.

The Minnesota seed-grain treater, M. B. MOORE. (Coop. Univ. Minn.). (*U. S. Dept. Agr., Misc. Pub. 330 (1938), pp. 6, figs. 4*).—This simple, homemade machine for farm use is described and illustrated.

Effect of phytohormones on seeds damaged by formaldehyde and other disinfectants, N. H. GRACE (*Canad. Jour. Res., 16 (1938), No. 8, Sect. C, pp. 313–329, pl. 1*).—Experiments with cereal seeds indicated that reductions in germination and early growth from formaldehyde treatment could be largely overcome by adding 1-naphthylacetic or 3-indolylacetic acids to the disinfectant solution. The optimal concentration for individual cereal varieties was found to lie between 0.01 and 5 p. p. m. Similar results were obtained with hormones after $CuSO_4$ and hot water treatments. The method is believed to have practical possibilities, and may also prove useful for comparing the physiological activities of different compounds.

Indexing farmers' seed lots for seed-borne organisms and response to seed disinfectants, R. H. PORTER, W. E. HENDERSHOTT, and G. N. DAVIS. (Coop. U. S. D. A.). (*Iowa Sta. Res. Bul. 238 (1938), pp. 241–272*).—Germination tests, examination for seed-borne pathogens, and determination of the effects of seed disinfectants were made with 129 seed lots of barley, 123 of corn, 75 of flax, 110 of oats, and 21 of wheat (1932–36). Laboratory detection of *Gibberella saubinetii* and *Helminthosporium sativum*, and other species of these groups, on seed samples of barley, oats, and wheat was found possible by examination of seedlings germinated on moist blotters at 20° C., and further evidence was obtained by developing blighted seedlings grown in autoclaved soil mixed with an equal part of sand. Detection of corn dry rots, principally *Diplodia zeae*, *G. saubinetii*, and Fusariums, was done by examining seedlings produced on moist blotters at 24°–27°, while *Basisporium gallarum* was detected more readily by carefully examining ungerminated, severely infected seed. Blighted seedlings and reduced germination usually accompanied the presence of several of the seed-borne organisms on seeds of barley, corn, oats, and wheat. The autoclaved soil-sand mixture proved a satisfactory substratum for ready determinations with the small grains.

Treatment of seeds of these four crops with organic mercury compounds practically controlled seedling blights in the laboratory, and samples benefiting most here responded similarly in the field. The effect of seed treatment on flax germination was similar to that with small grains. Dilution of 5 percent ethyl mercury phosphate to a 1 percent dust by adding French talc, button dust, or gypsum proved satisfactory both in laboratory and field tests, and the fillers alone were to some extent effective in increasing germination and yield. The development of such organisms as species of *Alternaria*, *Aspergillus*, *Macrosporium*, *Mucor*, *Penicillium*, and *Rhizopus* was practically controlled on seeds tested in blotters by ethyl mercury phosphate or chloride.

The greater difference in germination between treated and control seeds of corn, small grains, and flax in the laboratory than in the field may be due to the control of normally saprophytic fungi which probably cause less injury in the field. In general, the difference in yield from treated v. untreated seeds of barley, corn, and oats was significant in favor of the treatment, the greater increases obtaining from lots infected with seed-borne organisms. Germination of barley, corn, flax, oats, and wheat was usually less in the field than in the laboratory, but the relative rank was usually maintained in the field. With deficient rainfall, field germination is an inaccurate measure of viability. In this work, the laboratory tests proved reasonably indicative of the field responses.

A method of control of western celery mosaic, D. G. Milbrath and H. J. Ryan (*Calif. Dept. Agr. Bul., 27 (1938), No. 3, pp. 290–295*).—For many years celery has ranked as a highly important crop in Los Angeles County, Calif., and prior to 1931 the yields had been generally satisfactory. Following that year there was a sharp decline, and a survey in 1933 indicated that western celery mosaic was exceedingly widespread in the area, with an abundant source of infective material, liberal facilities for the spread and transmission of infection, and high infectiousness for celery. Tests of weeds and other truck plants in the district led to the conclusion that other host plants are probably infrequent. The disease was found in great abundance in several districts of this county, but not in San Diego or Orange Counties, though all had planted seedlings from the glasshouses of one of the infected districts. The practice of continuous cropping prevailed in Los Angeles County, and the accumulative effect of this cropping practice was deemed probably responsible for the epidemic conditions. Approach to the control problem was directed toward the temporary elimination of the primary host plant, through a voluntary non-celery period set up among the growers, who agreed that no celery should be grown in the field between July 31 and January 1 or in the glasshouse between September 1 and October 20, 1934. Following this drastic measure there was a decided increase in yield accompanied by a higher quality, the control proving most effective during the first 6 mo. of the year. While this method, enforced in a limited area, was highly gratifying in results, it is not held that it would necessarily be effective in other localities. It is believed that every virus situation must be regarded as a separate problem to be solved in accordance with local environal factors.

Corn-seedling virescence caused by Aspergillus flavus and A. tamarii, B. Koehler and C. M. Woodworth. (Ill. Expt. Sta.). (*Phytopathology, 28 (1938), No. 11, pp. 811–823, figs. 3*).—This condition, indistinguishable from the virescence due to certain genetic factors, was induced by inoculation of the seeds with *A. flavus* or *A. tamarii*. The terms "genetic" and "induced" virescence are here used to differentiate the two types. In both forms chlorophyll deficiency is aggravated by inadequate light or low temperature. Since a fungus operating in the soil is involved in the induced form, the soil condition also is a factor. Storage of the soil, noncropped for several months before use, and keeping it moderately wet while the corn is being grown, aided in producing virescence. A number of widely different soil types and of different fertility levels gave somewhat similar results.

Open-pollinated varieties of the dent, sweet, pop, flint, and flour types developed induced virescence in a large number of seedlings under proper conditions. A few highly resistant inbred lines of dent corn were found, but most inbred lines proved susceptible. Shaving the seed coat from the crowns of the kernels before shelling the ear proved very effective for inoculation, a break in the seedcoat being necessary for success. Though there was a difference in pathogenicity of the isolates, 10 of *A. flavus* and 2 of *A. tamarii* from various sources were effective in inducing the condition. A number of other fungi tested, including some *Aspergillus* spp., failed to cause virescence.

The relation of nitrogen nutrition to virulence in Phytomonas stewarti, G. L. McNew (*Phytopathology, 28 (1938), No. 11, pp. 769–787, figs. 4*).—Ten strains differing in invasive and wilting power for maize seedlings proved similar in most physiological and cultural characteristics, but differed in ability to use inorganic nitrogen (N). Two of the least virulent failed to use inorganic N, and the most virulent strain reduced nitrates to nitrites. Since strains intermediate in virulence did not possess these abilities and since the bacterium is a vascular parasite and presumably secures its nutrients from inorganic salts in the tracheal system, tests were made to determine whether these variations in ability to use inorganic N would account for the observed differences in virulence. The results indicated this ability to be correlated with virulence in a group of 757 isolates. All virulent isolates used inorganic N, and all failing to use it were only slightly virulent. The latter, when restored to virulence by host passage, were found to have acquired the ability to use inorganic N. Conversely, when slightly virulent strains were induced to use inorganic N in culture they increased in virulence. These simultaneous changes in the slightly virulent culture were brought about by selection of the varients produced and elimination of the parent type. Although the most virulent strain reduced nitrates, the nitrites formed were not the only cause of the severe wilting. Plants grown in sand and supplied with ammonium as the only N source were severely wilted even though no nitrites were produced. Most virulent strains of the bacteria prefer ammonium N, but it was found that when deprived of it they may reduce nitrates.

Spine development on the spores of Ustilago zeae, H. L. Hutchins and B. F. Lutman. (Univ. Vt.). (*Phytopathology, 28 (1938), No. 11, pp. 860, 861, fig. 1*).—Remarkable differentiation of the gelatinous layer, the developing wall with its spines, and the spore contents is said to follow use of orseilline BB in 3 percent acetic acid, with a counterstain of aniline blue also in 3 percent acetic acid, on sections of corn bolls infected with *U. zeae.*

Variability of Glomerella gossypii, A. J. Ullstrup. (U. S. D. A. and S. C. Expt. Sta.). (*Phytopathology, 28 (1938), No. 11, pp. 787–798, figs. 4*).—Since variation in cultures appeared on first isolation from diseased cotton seedlings, seeds, and bolls, it seems highly probable that such variant types also occur in nature. On artificial media the fungus proved highly variable, and the degree of variation was greater than observed in the first isolations. Variants arising in the laboratory could be classified into two main groups—one characterized by increases in aerial mycelium and the other group by scant growth of aerial mycelium and abundance of conidia. A third group contained heterogenous cultures with growth characters neither like the first two groups nor the parent culture. The conidia and young mycelium were found to be uninucleate, thus suggesting that variation is probably due to some fundamental change in the heritable nuclear material. All but one of the original cultures were highly pathogenic to cotton seedlings. As much variation in pathogenicity was found among variant cultures as that observed in cultural behavior. Low virulence was correlated directly with slow growth rate.

Gravity grading, a method for reducing seed-borne disease in cotton, K. S. Chester (*Phytopathology, 28 (1938), No. 10, pp. 745–749*).—Seeds were delinted with H_2SO_4 and then suspended in water and divided, respectively, into the fractions that sank and those that did not. Field, greenhouse, and laboratory tests on germination and emergence indicated that nearly all internally infected and weak seeds are removed by this procedure, and practical application thus seems feasible. Healthy germination and emergence of the heavy seeds were over twice as great as for the light seeds and half again as great as for the ungraded delinted seeds.

The emergence of smut-inoculated oat seedlings through sand and loam soil, P. F. Brandwein (*Bul. Torrey Bot. Club, 65 (1938), No. 7, pp. 477–483,* *fig. 1*).—Under severe tamping, the emergence of smut-inoculated seedlings of both resistant and susceptible varieties was reduced as compared with uninoculated controls. It is suggested that the coleoptile infection found by the author and others in inoculated susceptible and resistant varieties may be responsible for the failure to penetrate the tightly packed soil. Seedlings under heavy pressure showed a smaller size and lower germination of inoculated as compared with uninoculated plants. Both the Monarch (susceptible) and Markton (resistant) varieties showed similar reactions.

Incubation period of pea virus 1 in the aphid Macrosiphum solanifolii, H. T. Osborn (*Phytopathology, 28 (1938), No. 10, pp. 749–754*).—By exposing successions of healthy *Vicia faba* plants to colonies previously fed for short periods on infected plants, it was demonstrated that this virus undergoes an incubation period in *M. solanifolii*, the minimum being not less than 12 nor more than 18 hr. This is similar to the incubation period previously shown for the pea aphid, *M. pisi*. The potato aphids acquiring virus 1 were shown to retain it as long as 21 days when feeding continuously on insusceptible tomato plants. The bean aphid, *Aphis rumicis*, failed to transmit virus 1.

Artificial production of "blackheart" in potato tubers, B. N. Singh and P. B. Mathur (*Phytopathology, 28 (1938), No. 10, pp. 705–708*).—Blackheart, a physiological disease, was artificially produced by enclosing the tubers in sealed jars and heating to high temperatures. The percentage of diseased tubers obtained in this way was, however, extremely variable. It was shown in these tests that the developmental stage of the tubers previous to heating is an important factor in producing the trouble. Of the various developmental stages used, the tubers in middle dormancy proved most susceptible to blackheart, and there was evidence that the smaller potatoes are less susceptible to this type of injury than the larger ones.

The potato virus "X": Its strains and reactions, R. N. Salaman (*Roy. Soc. London, Phil. Trans., Ser. B, 229 (1938), No. 559, pp. 137–217, pls. 8, figs. 9*).—It is shown in this monographic study that at least six strains occur in Great Britain, and that most of them are also represented in Germany, Canada, and the United States. Although in the field plants are usually infected with more than one strain simultaneously, single-strain infections occur with the milder X^H and the more virulent X^N strains. The reactions of the strains on a wide range of plants are described. As judged by their behavior on *Datura* they range from the creation of symptomless carriers to intensely virulent necrosis. The "interveinal necrosis" induced by the X^N strain is described for the first time. Inclusion bodies accompanied infection by all the strains. The same type of nucleoprotein was recovered from plants infected by each strain, and in solution they exhibited anisotropy of flow. The physical properties proved very similar. It was found that a tenfold excess of a weak over a strong strain may lead to clinical masking of the latter in the host, and a lesser relation of strong to weak had the opposite result. The double reactions ensuing from mixtures of the different X strains with Y, A, or tobacco mosaic conformed to the actual differences in virulence of the respective strains. The X^H, X^G, X^L, and X^D strains all behaved in a similar manner in the presence of tobacco virus strains. Conversions of one strain into another have been effected by passage through certain unrelated hosts, all from the more to the less virulent strain. It is concluded that these are true mutations. Acquired immunity as exhibited by potatoes and other solanaceous plants with respect to X virus, its occurrence and nature, and the possible relation to the occurrence of certain types of carriers, are described. The structure of the virus particles is discussed, and a theory to account for the strain differences is advanced. A comparison of virus particles and genes is made, and it is suggested that the analogy should be with the free genes of the cytoplasm rather than with those of the nucleus.

Seventy-six literature references are given.

An annotated list of the fungi and bacteria associated with sugarcane and its products, J. A. Stevenson and R. D. Rands. (U. S. D. A. et al.). (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *42* (*1938*), *No. 4*, *pp. 247–313*).—During the 17 yr. elapsed since the publication of Caum's check list (E. S. R., 46, p. 346) many additions have been made from the cane-producing regions of the world, and also many changes have been proposed in the nomenclature of previously recorded species, making a revision desirable. In preparing the present list, Caum's plan has been followed in the main, with certain modifications and additions, and only those synonyms are cited which will be found in sugarcane disease literature. For the more important species a limited number of pertinent references are included, and the family to which each species belongs follows the classification system of Clements and Shear.[6] The essential characters of the organisms, together with their geographical distribution insofar as reported on *Saccharum* spp., are given. No new taxonomy is proposed, although the work is said to have revealed a number of new combinations that might well be made for the sake of uniformity.

Control of blue mold of tobacco with benzene vapor, P. W. Gumaer (*Indus. and Engin. Chem.*, *30* (*1938*), *No. 9*, *pp. 1076–1081*, *figs. 12*).—The author describes an engineering study of gassing tobacco seedbeds with benzene, based on the postulate that the percentage of its vapor in the bed atmosphere throughout the night is a correct measure of the amount of benzene to use. This percentage is said to be an accurate measure of the efficacy of benzene treatment of downy mildew (*Peronospora tabacina*) irrespective of weather conditions and tightness of bed. All fresh sporulation was stopped in two nights with a vapor concentration of 0.05 percent throughout the night, as measured by a special combustible gas indicator calibrated for benzene. Wetting cloth covers at sunset greatly increased the vapor concentration. Tightness of the bed and cover was more important than distance between evaporators or evaporation ratio. A wick evaporator developed in this study gave a more uniform vapor distribution, avoided the possibility of plant injury by excess vapor on hot nights, gave a higher concentration on cold nights, facilitated night filling, avoided plant injury from spilling of benzene, required no attention in the morning, and did not become clogged. All symptoms of blue mold were prevented with one evaporator per 20 sq. yd. of bed and 10 cc of benzene per square yard. Washed and wetted, 36- by 60-mesh cloth is said to be tighter than glass sash. Wetting the latter tightens it by filling the cracks between overlapping panes.

Chlorotic streak of sugar cane in the United States, E. V. Abbott. (U. S. D. A.). (*Phytopathology*, *28* (*1938*), *No. 11*, *pp. 855–857*, *fig. 1*).—This disease, possibly of virus origin, was first observed in the continental United States in 1937 and 1938 on several commercial and unreleased seedling varieties The symptoms are described and seed transmission is demonstrated. Its possible origin in the United States is discussed. Classification of varieties with respect to susceptibility is as yet impossible, but the hot-water treatment of cuttings is said to offer a means of starting healthy seed plats from infected susceptible canes.

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[6] The genera of fungi, F. E. Clements and C. L. Shear. New York: H. W. Wilson Co., 1931, pp. VII+496, pls. 58.

Tests of cigar-wrapper tobacco varieties resistant to blackshank, L. O. Gratz and R. R. Kincaid (*Florida Sta. Bul. 326 (1938), pp. 18, fig. 1*).—In experiments, 1933–36, involving the resistant varieties 301, 94–2, 94–4, Rg, and R, data were secured on plant characteristics, grades of cured and sweated leaves, and yields and soundness of wrappers on machine-made cigars. All showed relatively high resistance to blackshank but were about equally susceptible to root knot. Rg was latest in blooming but earliest in ripeness for priming, and the leaves of all five were very similar in size and shape. Grades of cured and sweated leaves and estimated average values for the second to fourth primings only indicated Rg, 94–4, and 94–2 to be somewhat superior, and R inferior to 301. Wrapper yields per pound of leaves were largest for Rg, followed in order by 301, 94–2, and 94–4. Rg (believed to be a hybrid) was somewhat superior in certain important factors to the others, but was followed closely by 301 (Big Cuba × Little Cuba). In general, the findings substantiated opinions of packers and manufacturers, and sales indicated that cigars wrapped with leaves of blackshank-resistant tobaccos (especially Rg and 301) are acceptable to the trade.

A new method for the purification of the tobacco mosaic virus, V. L. Rischkov and E. P. Gromyko (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 19 (1938), No. 3, pp. 203–205*).—The method described is based on the adsorption of tobacco mosaic virus by benzoic acid.

An ultracentrifugal analysis of the aucuba mosaic virus protein, R. W. G. Wyckoff (*Jour. Biol. Chem., 124 (1938), No. 3, pp. 585–588*).—Aucuba and ordinary strains of tobacco mosaic virus proteins were found to be similar but not identical in ultracentrifugal behavior. The first was more readily injured by salts. It was prepared in a seemingly unaltered state only by quantity ultracentrifugations, with distilled water as the intermediate solvent. Such a preparation gave the single sharp boundary indicative of one molecular species and had a sedimentation constant ±4 percent greater than that of ordinary strain protein. The molecules of the two proteins possessed nearly the same regions of pH stability.

A modification of the tobacco mosaic virus No. 1 occurring in Datura meteloides, H. L. Blood and R. D. Watson. (Utah Expt. Sta.). (*Utah Acad. Sci., Arts, and Letters, Proc., 15 (1937–38), pp. 15–19*).—It is concluded from this study that "the nature of the development of systemic symptoms, the protection of the systemically infected host from tobacco mosaic virus No. 1, the predominance of tobacco mosaic virus No. 1, together with the similarity of the systemic virus and tobacco mosaic in physical properties and the existence of differential hosts indicate that the systemic virus may be a permanent modification of the tobacco mosaic virus No. 1 occurring within the tissues of the host plant *D. meteloides*."

Generalized standard errors for evaluating bunt experiments with wheat, S. C. Salmon. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 8, pp. 647–663, figs. 5*).—Evidence from tests to determine differences in bunt infection of wheat varieties indicated that estimating random variation by analysis of variance, or by any method grouping all varieties together irrespective of bunt infection, may err seriously if varieties are included which differ materially in infection. The binomial and chi-square determinations, as in their usual statistical employment, are also said to be unreliable for bunt resistance tests, since they account only for the random variation due to simple sampling and not for that due to environal heterogeneity. It is suggested that estimates of random error commonly used in similar experiments with plant diseases, or with certain other variables, may also be in error.

In the bunt tests reported the standard error was in considerable degree a function of the infection, approaching 0 at 0 and 100 percent infection and attaining a maximum at ±50 percent levels. The curve was similar in form to that expressed by the binomial. Introducing a constant into the latter formula to account for random errors other than those due to simple sampling rendered it possible to predict the standard errors with fair accuracy when the observed standard error for any given infection level was known. A method is presented for estimating standard errors for grouped bunt data, making use of the relation between standard error and bunt infection. Although the method is not regarded as strictly accurate, since it assumes like standard errors for all varieties at the same infection level, it is believed to be more reliable than those usually employed.

Apple scab and apple blight, I. E. Melhus and G. C. Kent. (Iowa Expt. Sta.). (*Iowa State Hort. Soc.* [*Rpt.*], *72* (*1937*), *pp. 106–112, figs. 1*).—Following a survey in five Iowa counties indicating the need for a reinvestigation of scab control, orchard experiments were conducted (1933–37) and showed that in Iowa the scab spores are often discharged before the cluster bud spray. It is thus advantageous to know when the spores are matured and ready to be discharged in order that the spray may be timed to precede the first ascospore discharge, rather than to depend wholly on the developmental stage of the flowers. In some seasons a prepink spray should be applied. No lime-sulfur substitutes were found. Spraying of infected leaves on the ground in spring to kill the fungus can be considered only as a supplementary measure.

The bacterial blight has been known in the State since records have been available, and has been troublesome at various times, as noted in 1858 and later. Several of the serious outbreaks are briefly referred to, and recent developments in its control are outlined. The treatment of cankers (especially when young) has proved effective when thoroughly done. A $ZnCl_2$ mixture (9 lb. $ZnCl_2$, 1 qt. water, and 3 oz. HCl) seems to have been most successful, and bordeaux mixture (1–3–50 or 1–5–50) applied twice, when 25 and 80 percent, respectively, of the flowers are in bloom, had a beneficial effect in localities where blight was serious. Data in regard to transmission by bees from the hive appeared to indicate little danger in using bee colonies which were in an infected orchard the previous year if the bees are moved before the trees become active in the spring.

Fire-blight canker treatments, B. D. Drain (*Tennessee Sta. Circ. 62* (*1938*), *pp. 4, figs. 6*).—This replaces Circular 36, previously noted (E. S. R., 65, p. 150).

Experiments with liquid lime sulphur for spraying apples, H. W. Thurston, Jr., and H. J. Miller. (Pa. Expt. Sta.). (*Phytopathology, 28* (*1938*), *No. 11, pp. 823–832*).—Continuing these orchard spray tests from the 1935–36 seasons (E. S. R., 75, p. 345), the 1937 experiment was laid out in 150 randomized plats of single apple trees with 24 treatments and a nonsprayed control, each replicated 6 times in a solid block of Stayman trees, ±20 yr. old, in Adams County, Pa. The set-up permitted analysis of variance of the results, the study dealing with dilutions of liquid lime-sulfur, together with such factors as dosage and addition of hydrated lime, and their effects on foliage injury, fruit scab, and tree yield. Each tree was covered first from underneath, and then from the outside, the pressure was maintained at 550 lb., and an effort was made to cover all trees uniformly. Applications were made at the delayed dormant, pink, and petal fall stages, followed by 4 cover sprays between June 1 and July 18, and the dilutions ranged from 1–50 to 1–200, each with and without added lime.

Based on leaf counts, scab was shown to increase progressively with spray dilution, but foliage injury tended to lessen with dilution up to 1–100 and to increase sharply with dilution above that point. This effect is believed attributable to the liberation of soluble arsenic. In general, a dosage of 12 gal. per tree resulted in greater injury and better scab control than one of 6 gal. per tree, but decreased the yield. Use of lime with various dilutions and dosages was shown to reduce injury and to increase yield, but also to permit a slightly greater scab development. While the authors were not here concerned primarily with recommendations, it seemed evident from the results obtained that, when foliage injury, scab, and yield are all considered, a dilution of 1–75 would provide the best balance between injury and scab control.

No problem so complicated as orchard spraying can be solved in one year's field work, but the authors are convinced that a randomized plat layout, such as here employed, can be used advantageously, and that the extra labor involved is well worth the effort.

Recent advances in apple spray programs, J. H. GOURLEY. (Ohio State Univ.). (*Iowa State Hort. Soc.* [*Rpt.*], *72* (*1937*), *pp. 112–117*).—This review discusses earlier concepts in spraying, comparison of sprays for control of apple scab, and suggested spray formulas for Ohio conditions. In general, for postbloom one-half of the strength used in the prebloom sprays is recommended. If scab is controlled early, for the rest of the season it is just as important to look to the preservation of the finish of the fruit. With varieties very susceptible to russeting, the author used only lime and lead arsenate in the postbloom sprays.

Earlier tests and continued use of mild sprays in Ohio, F. H. BALLOU. (Ohio Expt. Sta.). (*Iowa State Hort. Soc.* [*Rpt.*], *72* (*1937*), *pp. 117–122*).—The author reviews the experiences of orchardists and station workers in apple spraying in Ohio, especially for the past 15 yr. It is stated that successful use of unusually mild or dilute sprays depends very largely on timeliness and thoroughness of application. The more recently tested and extensively used liquid lime sulfur-wettable sulfur combinations are considered to be sprays of but moderate cost, yet the results of their use in the form of clean, glossy, highly colored, sound apples—even in years of severe scab—clearly reveal what safe, potent, relatively inexpensive sprays are capable of accomplishing when timely and thorough applications are made.

Exanthema in pear and copper deficiency, J. OSERKOWSKY and H. E. THOMAS. (Univ. Calif.). (*Plant Physiol.*, *13* (*1938*), *No. 3*, *pp. 451–467*, *figs. 4*).—Exanthema on Bartlett pear trees in central California is described and attributed to soil conditions. Trees with this trouble were cured by application of copper salts to the soil, by introduction of crystals of copper salts into the root crown of the tree, and by spraying with bordeaux mixture. Copper salts appeared to exert a specific beneficial action on trees with exanthema, since $MnCl_2$, $ZnSO_4$, ferric citrate, $K_2Cr_2(SO_4)_3$ $NaVo_3$, $CdSO_4$, $Co(NO_3)_2$, and $Ni(NO_3)_2$ failed to correct the abnormal condition. The copper content of leaves and shoots from trees within the affected area proved to be invariably lower than that from samples taken in localities free from the trouble. There was, however, no consistent difference in copper content of healthy v. diseased trees in the individual orchard affected with exanthema. The relation was similar to that obtaining with regard to iron in chlorotic trees. "Exanthema in all probability is due to a deficiency of copper per se."

Pathogenicity of culture-reared specimens of the bud-and-leaf nematode and the susceptibility of different strawberry varieties, J. R. CHRISTIE (*Phytopathology*, *28* (*1938*), *No. 8*, *pp. 587–591*, *fig. 1*).—Continuing these studies

(E. S. R., 79, p. 645), when strawberry plants were inoculated with specimens of the southern strawberry strain of *Aphelenchoides fragariae* from agar cultures maintained continuously for 8–21 mo., typical symptoms of summer dwarf usually resulted, both in the greenhouse at Washington, D. C., and in the open field at Willard, N. C. A plat with 20 plants each of 38 varieties of cultivated strawberries was established at Willard. When inoculated with culture-reared specimens of the southern strain, one or more plants of every variety developed typical symptoms of summer dwarf, but the severity of the symptoms varied considerably in different varieties.

Control of melanose on citrus, W. A. Kuntz and G. D. Ruehle (*Citrus Indus., 19 (1938), Nos. 8, pp. 3, 6, 7, 15, 18, 19, 22; 9, pp. 11, 12*).—From melanose control studies carried to the point here described several generalizations are made. As a disease of commercial citrus varieties in Florida it is believed that it cannot be entirely eliminated from the trees, the causal *Phomopsis* being always present and inducing varying degrees of damage from season to season. However, there are said to be several strong modifying factors which may determine the relative severity among both seasons and groves. Although not studied in great detail, cold injury, "cropping strain," and severe scale infestations should be avoided as far as possible as an assistance to better melanose control. There are also times and seasons when pruning is essential in lessening the abundance of the melanose fungus. It is believed that the combined pruning and spraying of citrus trees will produce the best results from the standpoints both of the trees and of production of bright fruits.

A Poria as the fruiting stage of the fungus causing the sterile conks on birch, W. A. Campbell and R. W. Davidson. (U. S. D. A.). (*Mycologia, 30 (1938), No. 5, pp. 553–560, figs. 3*).—Usually considered a form of some *Fomes* sp., the authors identify this sterile fungus, so common on living birches in certain localities, as *Poria* sp.

Twig cankers of Asiatic chestnuts in the eastern United States, M. E. Fowler. (U. S. D. A.). (*Phytopathology, 28 (1938), No. 10, pp. 693–704, fig. 1*).—Asiatic chestnuts on poor sites were found severely infected by canker and die-back, while those on sites permitting optimum growth have not thus far been found seriously affected. Several fungi have been found associated with the dead twigs, and *Cryptodiaporthe castanea*, *Botryosphaeria ribis chromogena*, and *Diplodia* sp. were demonstrated capable of invading living tissues and inducing cankers and die-backs in twigs of Asiatic chestnuts. *C. castanea*, originally described on *Castanea sativa* in Europe, has been found in 18 States and the District of Columbia. It has been present in 30- to 40-year-old Asiatic chestnut orchards for some time, though it is unknown whether this fungus is also native to this country. It is sometimes injurious to nurseries and may cause the death of planted trees, but more frequently kills individual branches, thus decreasing growth and deforming the trees. The other two fungi have been collected only a few times and as yet are not known to be of great importance. Proper culture conditions and destruction of all diseased tissue are recommended control procedures. The means of spread of these fungi are as yet unknown.

The longevity of Ceratostomella ulmi in soils, A. F. Verrall. (U. S. D. A.). (*Phytopathology, 28 (1938), No. 10, pp. 763–765*).—Attempts to isolate this fungus from soils in contact with diseased stumps failed. In the laboratory *C. ulmi* survived throughout the test (10 mo.) in 7 types of sterilized soils but survived only sparingly for 3 mo. and not at all for 6 mo. in soils in competition with normal soil organisms.

A phloem necrosis of elm, R. U. Swingle. (U. S. D. A. and Ohio Expt. Sta.). (*Phytopathology, 28 (1938), No. 10, pp. 757–759*).—The author reports that for several years an epidemic dying of American elms has occurred in the central and lower Ohio River watershed. Affected trees were observed to die in 3–36 mo. after the first apparent symptoms, and no recoveries have been noted. The disease is extremely virulent and has spread rapidly in Ohio. Symptoms are first seen in the extreme top at outer tips of branches, and the foliage becomes thin. The leaves droop and the blades curl upward at the margin, producing a trough-like effect that makes the leaves appear narrow and grayish-green and the entire crown of the tree thin. Later, the foliage becomes yellowish-green and finally yellow, followed by defoliation. In fairly advanced stages the roots die, the small fibrous ones first. Typical discoloration of the phloem and cambium precedes death of the larger roots, and an odor resembling wintergreen characterizes the moderately discolored phloem.

Though over 4,000 attempted isolations have been made, no organism has been secured consistently and inoculations (2 yr.) with the organisms obtained have failed to indicate pathogenicity. From these and other experiments and observations, it appears that the disease is of a virus nature and that it is systemic.

Species of Eutypella and Schizoxylon associated with cankers of maple, R. W. Davidson and R. C. Lorenz. (U. S. D. A.). (*Phytopathology, 28 (1938), No. 10, pp. 733–745, figs. 5*).—Of these two cankers, here reported for the first time, the one due to *E. parasitica* n. sp. has dense white to light buff mycelial fans under the bark at the margin, and with the fungus usually fruiting on it. The other canker has associated with it the pycnidial stage of *S. microsporum* n. sp. The ascus stage was found on one canker, and cultures from ascospores were the same as those from pycnospores. The *Eutypella* canker is reported to be common in the Lake States, and has also been collected in New York, Vermont, and New Hampshire, while the one due to *Schizoxylon* is of occasional occurrence throughout the Lake States. Both appear to induce conspicuous killing of the bark and distortion of the trunk. The two fungi have been repeatedly isolated from the margins of active cankers and also from discolored wood back of the killed areas, and such isolates appear to be identical with cultures from ascospores. A few inoculations have been made on *Acer saccharum* and the fungi reisolated, but insufficient time had elapsed for typical canker formation.

Interfertility phenomena in Fomes pinicola, I. Mounce and R. Macrae (*Canad. Jour. Res., 16 (1938), No. 9, Sect. C, pp. 354–376, fig. 1*).—Studies of sexuality in *F. pinicola* based on material from 43 new sources, combined with previously published results[7], led to the following conclusions:

"Collections from North America may be divided into two groups, a large group A and a small group B. Monosporous mycelia of any culture in group A are compatible (mutually fertile) with those of every other member of the group; similarly monosporous mycelia of any member of group B are compatible with other monosporous mycelia of group B; but monosporous mycelia of group A are almost completely incompatible (sterile) when paired with those of group B. Collections of European and Japanese origin form a third group C. These are almost completely compatible with group A and only partially incompatible with group B. In group B are several isolates of the so-called *Populus* or hardwood form of *F. pinicola* which has been designated at times as a separate species *F. marginatus*. The remainder are, however, the typical coniferous or 'red-belt' form."

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[7] Canada Dept. Agr. Bul. 111, n. ser. (1929), pp. 75, pls. 10.

Susceptibility of needles of different ages on Pinus monticola seedlings to Cronartium ribicola infection, R. K. Pierson and T. S. Buchanan. (U. S. D. A.). (*Phytopathology, 28 (1938), No. 11, pp. 833–839*).—Thirty-four potted native western white pine seedlings 5–7 yr. old and 7–15 in. high were exposed to *C. ribicola* infection on native *Ribes petiolare* bushes, September 7 to October 11, 1933, at Deep Creek, Idaho. After a minimum incubation of 66 days the resultant needle spots were tallied and summarized on the basis of age of needles exposed. From this it was seen that needles of the current season were relatively low in susceptibility, those of the second and third relatively high and approximately equal, and needles of the fourth season intermediate but still rather high in susceptibility.

Age of susceptibility of Ribes petiolare leaves to infection by aeciospores and urediospores of Cronartium ribicola, R. K. Pierson and T. S. Buchanan. (U. S. D. A.). (*Phytopathology, 28 (1938), No. 10, pp. 709–715*).—The leaves developing on 30 seedlings in the greenhouse were tagged at 4-day intervals until those in all age classes up to the 69- to 72-day age group, inclusive, were represented. The plants were then divided into two equal lots and the area of each leaf was determined. Two days after making these determinations, one lot of plants was inoculated with an aqueous suspension of *C. ribicola* aeciospores and the other with a similar suspension of urediospores. After 11–12 days' incubation the leaves were stripped and the infection flecks counted. The younger leaves proved most susceptible to infection from either spore type. This susceptibility remained high until about the time of size-maturity, which was approximately 3 weeks after the leaves had emerged from the buds. After this stage increases in leaf age were accompanied by decreases in susceptibility.

Vegetative propagation of white pine as a possible method of blister rust control, N. T. Mirov. (U. S. D. A.). (*Jour. Forestry, 36 (1938), No. 8, pp. 807, 808*).—The author showed in preliminary tests that the vegetative propagation of *Pinus strobus* is perfectly feasible physiologically. This is believed to open new hope for the rapid development of a strain immune to blister rust.

A study of forking in red pine, J. A. Jump (*Phytopathology, 28 (1938), No. 11, pp. 798–811, figs. 4*).—In the northeastern United States a disturbance in *Pinus resinosa* occurs which is initiated by precocious growth of lateral shoots in winter bud clusters during the summer and fall. This results in forks which fail to unite normally during subsequent development, leaving fissures in which parasitic and saprophytic organisms enter. *Tympanis* sp. was found in these fissures, and *Dematium pullulans* was frequently isolated both from precocious buds and the pith of forked trees. According to tests (lupine technic) for detection of growth substances, *D. pullulans* produced a greater amount of growth substance than yeast and certain other fungi. It is thus suggested that production of growth substance by a fungus within the tissues might account for the preseasonal bud-growth stimulation.

Some aspects of the control of spike disease in sandalwood, A. V. Varadaraja Iyengar (*Phytopathology, 28 (1938), No. 10, pp. 715–723*).—From this detailed and critical analysis of previous studies of the disease, including those by the author, it is concluded that its infectious nature necessitates prompt action in eliminating all possible factors contributing to its spread in the forest. Since there is no certainty as to whether attacks may be mild or virulent, or as to the areas that may next become infected, the problem assumes greater importance. Attention has been directed to its economically accomplished elimination through killing affected plants with toxic chemicals, such as sodium arsenite, whereby alone the disease has been considerably checked. This procedure has now been adopted in Madras and Coorg. Knowledge of the carrier is still obscure, but even here the removal of diseased plants simplifies the problem of control. The possibility of the carrier transmitting infection from other hosts has not been ignored, but seems to be of less importance. Considerable attention has been drawn to the necessity of proper diagnosis in the field and to the phenomenon of masking, but much yet remains to be learned regarding the factors in susceptibility and resistance. It is claimed that substantial improvement in the growth of sandal can be realized by eradication of lantana, which has slowly permeated even some of the dense forests of the Deccan Plateau.

Relative durability of black locust and shipmast locust when subjected to four wood decay fungi, E. R. Toole (*Jour. Forestry, 36 (1938), No. 11, pp. 1120–1122*).—Wood of the shipmast locust (*Robinia pseudoacacia rectissima*) has long been considered more durable in service than that of the common black locust, and the results of certain laboratory tests have been interpreted to confirm this idea. The author subjected these data to an analysis of variance, finding that with the four fungi tested, viz, *Polyporus robiniophilus*, *Fomes igniarius*, *F. rimosus*, and *Poria incrassata*, the difference in amount of decay induced in wood of the two locust species was significant only for the last two fungi.

Studies in wood decay.—VIII, The effect of the addition of dextrose and dextrose and asparagine on the rate of decay of Norway pine sapwood by Lenzites trabea and Lentinus lepideus, H. Schmitz and F. Kaufert. (Univ. Minn.). (*Amer. Jour. Bot., 25 (1938), No. 6, pp. 443–448. figs. 2*).—Continuing this series (E. S. R., 80, p. 217), a study of the effect of the addition to wood of dextrose and of dextrose plus asparagine on its rate of decay by wood-destroying fungi indicated that this rate by some fungi (e. g., *Lenzites trabea*) may be increased by adding such materials, provided the amounts are not too great. With other fungi (e. g., *Lentinus lepideus*) it appeared that the rate of wood decay induced was decreased by adding these substances to the culture. In such cases the fungus may, for at least a time, develop largely at the expense of the sugar and asparagine present and only to a limited extent at the expense of the wood substance.

Studies on Polyporus abietinus.—I, The enzyme-producing ability of the fungus, K. H. Garren (*Phytopathology, 28 (1938), No. 11, pp. 839–845*).—This fungus, destructive of coniferous sapwood, was shown to form 15 of the commoner hydrolytic enzymes (emulsin, cellulase, ligninase, amylase, sucrase, maltase, inulase, pectinase, tanninase, pepsin, trypsin, erepsin, urease, asparaginase, and lipase) and 4 of the commoner oxidizing enzymes (oxygenase, peroxidase, laccase, and catalase). It is said to produce more kinds of enzymes than previously reported for other wood-destroying fungi except *Lenzites saepiaria*. The great variety of hydrolytic enzymes produced by *P. abietinus* indicates that materials stored in the wood parenchyma are of considerable importance in its nutrition. In vitro and in vivo methods indicated the former to demonstrate more accurately the total number of enzymes a given microorganism is capable of producing.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Atlas of the hair of man, fur-bearing, and other mammals, edited by T. Lochte (*Atlas der menschlichen und tierischen Haare. Leipzig: Paul Schops, 1938, pp. XII+306, figs. 506*).—Part 1 of this work (pp. 1–60) deals with the hair of man, and part 2 (pp. 61–113) of other mammals. Part 3 (pp. 114–282) consists of an atlas showing the structure of types of human hair under normal and abnormal conditions and of animal forms. A 13-page list of references to the literature is included.

[Contributions on wildlife research and management] (*U. S. Dept. Agr., Bur. Biol. Survey, Wildlife Res. and Mangt. Leaflets BS–105 (1938), pp. 4; BS–106, pp. 7; BS–107, pp. 5; BS–108, pp. 8; BS–109, pp. 7, pls. 2; BS–110, pp. 7; BS–111, pp. 10, pl. 1; BS–112, pp. 3; BS–113, pp. 6; BS–114, pp. 2, pl. 1*).—Further contributions in this series (E. S. R., 78, p. 812) are as follows: The Federal Aid to Wildlife Restoration Act, by A. M. Day (BS–105); Report on Extension Work in Wildlife Conservation to December 1937, by I. T. Bode (BS–106); Planning for Wildlife Management—an Outline (BS–107); History and Significance of American Wildlife, by H. P. Sheldon (BS–108); Fort Niobrara Game Preserve, Nebraska, by C. Ruth (BS–109); Status of Eelgrass (*Zostera marina*) on the North Atlantic Coast, February 1938, by C. Cottam (BS–110); The Waterfowl Situation, 1937–38 (BS–111); Tankage and Livermeal as a Summer Feed for Adult Minks, by C. F. Bassett (BS–112); European and American Methods of Rat Control, by E. M. Mills (BS–113); and Care of Rabbits During Warm Weather, by G. S. Templeton (BS–114).

Transactions of the Third North American Wildlife Conference (*Washington, D. C.: Amer. Wildlife Inst., 1938, pp. X+901, figs. 74*).—The proceedings of this conference (E. S. R., 78, p. 811), held in Baltimore in February 1938, appear in two parts, the first containing the general sessions (pp. 1–240) and the second the special sessions (pp. 241–901). Contributions from the State experiment stations include the following: Methods of Studying Browse Preferences of Deer [*Odocoileus virginianus virginianus*], by J. L. Deen (pp. 256–260) (Pa.), and Redheads [*Nyroca americana*] and Ruddy Ducks [*Erismatura jamaicensis rubida*] Nesting in Iowa, by L. J. Bennett (pp. 647–650), Censuring the Ringneck Pheasant [*Phasianus torquatus colchicus*] in Iowa, by L. J. Bennett and G. O. Hendrickson (pp. 719–723), Modifications in Predation Theory Suggested by Ecological Studies of the Bobwhite Quail [*Colinus virginianus*], by P. L. Errington and H. L. Stoddard (pp. 736–740), and Winter Food and Cover of Mearns Cottontail [*Sylvilagus floridanus mearnsii*], by G. O. Hendrickson (pp. 787–793) (all Iowa, U. S. D. A., et al.).

Experimental feeding of deer, A. A. Nichol (*Arizona Sta. Tech. Bul. 75 (1938), pp. 39, figs. 16*).—In experiments conducted over a 3.5-yr. period 38 deer, species native to Arizona, were fed to determine the food requirements necessary for growth, maintenance, and reproduction. It was shown that the coefficient 2.35 multiplied by the hundredweight of deer will give in pounds the amount of air-dry forage removed daily by the deer from the range. Palatability tests were run on 168 different native plants. It was demonstrated by these tests that shrubs make a dependable and substantial part of the deer diet, and that the tree forages, grasses, weeds, and annuals are also very important. Details of the seasonal availability and palatability of plants represented by 26 species of trees, 16 species of grasses, 39 species of shrubs and vines, 19 miscellaneous plants, and 68 species of herbs and annuals are reported in infolded tables.

[Contributions on economic insects, insecticides, and insect control] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1938, E–439, pp. 14, pls. 2; E–440, pp. 2; E–441, pp. 3; E–442, pp. 3, pl. 1; E–443, pp. 3, pls. 2; E–444, pp. 57; E–445, pp. 11, pls. 2; E–446, pp. 69; E–447, pp. 2; E–448, pp. 4, pls. 4; E–449, pp. 5; E–450, pp. 4*).—The following contributions are in continuation of this series (E. S. R., 79, p. 504): Hemipterous Cotton Insects of Arizona and Their Economic Importance and Control, by T. P. Cassidy and T. C. Barber (E-439); Thallium as an Ant Poison (E-440); "Sand Flies" and "Punkies" (E-441); The Timing of Spray Applications for the Control of the Pecan Nut Casebearer, by C. B. Nickels (E-442); A Method for Mixing Insecticidal Dusts Containing a Conditioner, by T. E. Bronson (E-443), which supersedes ET-115 (E. S. R., 79, p. 504); Losses Occasioned by Insects, Mites, and Ticks in the United States, by J. A. Hyslop (E-444); Experimental Clipping of Green Corn Ears for [Corn] Earworm Control, by G. W. Barber (E-445); Abstracts of Foreign and Domestic Patents Relating to Derris, Lonchocarpus, Tephrosia, and Rotenone, by R. C. Roark (E-446); The Control of Cattle Lice [*Linognathus vituli* (L.), the Cattle Biting Louse, and the Short-Nosed Cattle Louse], by O. G. Babcock (E-447) (coop. Tex. Expt. Sta.); The Distribution of Pea Weevil Infestations in the Palouse Area of Northern Idaho and Eastern Washington, by T. A. Brindley and F. G. Hinman (E-448) (coop. Idaho, Wash., and Oreg.); Some Insects and Other Pests Attacking Raspberries and Blackberries and How to Control Them, by D. J. Caffrey (E-449); and The Tobacco Moth as a Pest in Growers' Pack Houses in North Carolina and Virginia, by W. H. White (E-450).

[Notes on economic insects and their control] (*Jour. Econ. Ent., 31 (1938), No. 5, pp. 630-634*).—The notes here presented (E. S. R., 80, p. 70) are as follows: Physical Characteristics on the Foliage of Beans and Tomatoes That Tend to Control Some Small Insect Pests, by K. B. McKinney (pp. 630, 631), Toxicity of Ether-Soluble and Ether-Insoluble Fractions of Commercial Phenothiazine to Certain Insects, by L. E. Smith (p. 631), and The Weight of Foliage From Different Crown Levels of Trees and Its Relation to Insect Control, by S. F. Potts (pp. 631, 632) (all U. S. D. A.): Note on the Attempted Establishment of *Paratheresia* in Louisiana, by C. H. T. Townsend (p. 632); Microtechnique Method of Testing Oil Insecticides on Scale Insects, by R. H. Smith (pp. 632, 633) (Univ. Calif.); and The Effect of Cold Storage on the Reproduction of Parasitic Hymenoptera, by S. E. Flanders (pp. 633, 634) (Calif. Citrus Expt. Sta.).

[Report of work in economic entomology], D. B. MACKIE (*Calif. Dept. Agr. Bul., 25 (1936), No. 4, pp. 455-481, figs. 4; 26 (1937), No. 4, pp. 418-438, figs. 3*).—The progress of work in 1936 and 1937 (E. S. R., 76, p. 655) with economic insects in California, particularly control, is reported.

Some insect and other animal pests in Hawaii not under satisfactory biological control, C. E. PEMBERTON and F. X. WILLIAMS (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 42 (1938), No. 3, pp. 211-230*).—Information on the insect pests of Hawaii which seriously damage plants of agricultural or ornamental value is summarized in brief form and suggestions offered wherever possible to serve as a guide to those investigating many of these pests. Information on 35 forms is thus briefly summarized in connection with a list of 121 references to the literature consulted.

[Contributions on economic insects] (*Iowa State Hort. Soc. [Rpt.], 72 (1937), pp. 124-128, 302-304, 390-398, figs. 2*).—Contributions presented (E. S. R., 79, p. 217) include The 1937 Survey of Orchard Insect Pests, by C. H. Richardson and H. Gunderson (pp. 124-128) (Iowa Expt. Sta.); How Insects Eat and Breathe and How They May Be Killed—the Various Insecticides, by H. Gunderson (pp. 302-304); and Races of Bees for Iowa, by O. W. Park (pp. 390-398) (Iowa).

[Contributions on economic zoology and entomology] (*Kans. Acad. Sci. Trans., 40 (1937), pp. 135-178, 349-367, 401-409, figs. 11*).—Contributions presented include the following: Differential Resistance to Chinch-Bug Attack in Certain Strains of Wheat, by E. T. Jones (pp. 135-142) (U. S. D. A.); The Life History and Control of the Boxelder Bug in Kansas, by R. C. Smith and B. L. Shepherd (pp. 143–159) (Kans. State Col.); The Biology and Synonymy of the Parasites of the Strawberry Leaf Roller (*Ancylis comptana* Froel. (Lepidoptera: Tortricidae)) Found in Kansas, by S. A. Summerland (pp. 161–178); The Lizards of the Southeastern United States, by C. E. Burt (pp. 349–366); Occurrence of *Capillaria* (Nematoda) [*C. columbae*] in a Colony of Pigeons and Methods of Control, by G. E. Cauthen (p. 367) (Kans. State Col.); and Additional Distributional Records of Amphibians and Reptiles in Kansas Counties, by J. A. Tihen (pp. 401–409).

The insects of North Carolina, C. S. Brimley (*Raleigh: N. C. Dept. Agr., 1938, pp. 560*).—An annotated list of insects of North Carolina and their near relatives, 10,218 in number, systematically arranged.

[Contributions on economic insects in Utah]. (Utah Expt. Sta.). (*Utah Acad. Sci., Arts, and Letters, Proc., 15 (1937–38), pp. 63–87, 93–97, 103–105, 123–130, figs. 3*).—Among the contributions presented (E. S. R., 80, p. 218) are the following: Mormon Crickets and Their Control in Utah Since 1923, by C. J. Sorenson and H. F. Thornley (pp. 63–70); Pea Aphid Investigations, by G. F. Knowlton, C. F. Smith, and F. C. Harmston (pp. 71–80); Utah Grasshoppers of 1937, by G. F. Knowlton and C. J. Sorenson (pp. 81–87); Walking-Sticks Found in Utah, by W. W. Henderson and A. Levi (pp. 93–97); Blood-Sucking Utah Diptera, by G. F. Knowlton, F. C. Harmston, and D. E. Hardy (pp. 103–105); Utah Asilidae, by G. F. Knowlton and F. C. Harmston (pp. 123–125); and Notes on Berry Insects of Utah, by G. F. Knowlton and L. L. Hansen (pp. 127–130).

[Work in entomology by the Utah Station] (*Utah Sta. Bul. 282 (1938), pp. 77–83, figs. 4*).—Brief reference is made to the history and progress of work with economic insects by the Utah Station since its organization.

Proceedings of the Entomological Society of British Columbia (*Ent. Soc. Brit. Columbia, Proc., No. 34 (1938), pp. 65, figs. 7*).—Contributions here presented (E. S. R., 78, p. 219) include the following: Notes on Some Phenomenal Feeding of Ticks, by J. D. Gregson (pp. 8–11); The Long-Winged Thrips *Scirtothrips longipennis* Bagn. and Its Control in Greenhouses, by H. Andison (pp. 12–17); Mass Collecting of *Labia minor* L., the Small Earwig, by J. K. Jacob (pp. 18, 19); Some Food Plants of Lepidopterous Larvae—List No. 5, by J. R. J. Llewellyn-Jones (pp. 20, 21) (E. S. R., 78, p. 220); Biological and Morphological Differences Between *Eriosoma crataegi* (Oestlund) and *Eriosoma lanigera* (Haus.), by A. D. Heriot (pp. 22–32); Further Notes on the Woolly [Apple] Aphis Parasite *Aphelinus mali* Hald., by E. P. Venables (pp. 33–35) (E. S. R., 67, p. 283); Further Notes on the Fleas of British Columbia (pp. 36–38) (E. S. R., 76, p. 656) and Ectoparasites of Birds and Mammals of British Columbia—II, A Preliminary List of the Pupipara, Louse Flies (pp. 39–45), both by G. J. Spencer; The Importance of Phenological Notations During Insect Ecological Studies, by J. D. Gregson (pp. 46–48); and Some Notes on the Periodicities of Certain Insects in Relation to the Sun Spot Cycle, by H. A. Richmond (pp. 49–53).

Sixty-eighth annual report of the Entomological Society of Ontario, 1937 (*Ent. Soc. Ontario, Ann. Rpt., 68 (1937), pp. 91, figs. 14*).—Contributions presented in this report (E. S. R., 80, p. 223) include the following: Biology of the Plum and Peach Leafhopper *Macropsis trimaculata* (Fitch), by A. Hartzell (pp. 6–12); The Forest Insect Survey, by A. W. A. Brown (pp. 13–18); Experiments in the Control of Green Apple Bug [Pear Plant Bug], Apple Redbug, and the Pale Apple Leafhopper [White Apple Leafhopper] by Means of Pyrethrum Dusts and Sprays, by N. A. Patterson (pp. 18, 19); Some Records of Captures in Orchard Light Traps, by F. C. Gilliatt (pp. 19–24); The Simultaneous Propagation of *Macrocentrus ancylivorus* Rohwer and *Ascogaster carpocapsae* Vier. on the Peach Moth (*Laspeyresia molesta* Busck)—a Study in Multiple Parasitism, by W. E. van Steenburgh and H. R. Boyce (pp. 24–26); Controlling Codling Moth With Nicotine-Bentonite, by J. M. Merritt (pp. 26, 27); Notes on [European] Corn Borer Resistance in Hybrid Corn, by R. W. Thompson (pp. 28–32); A Laboratory Technique for the Comparison of Contact Insecticides, Using *Drosophila* flies, by C. W. B. Maxwell and F. T. Lord (pp. 33–36); Some Results in Controlling the Onion Maggot (*Hylemyia antiqua* Meig.) With Calomel, by G. G. Dustan (pp. 37–43); Controlling the Pea Aphid With Vaporized Nicotine, by J. F. Alsterlund (pp. 43, 44); Further Notes on Parasites of Aphids, by J. H. McLeod (pp. 44–48) (E. S. R., 80, p. 223); The European Spruce Sawfly Situation in Western Quebec and Ontario, by C. E. Atwood (pp. 48–50); Notes on the Occurrence of *Diprion frutetorum* Fabr. in Southern Ontario, by D. E. Gray (pp. 50, 51); Notes on the Fall Cankerworm and the Effectiveness of Banding, by R. E. Balch (pp. 51–55); The Importance of Cleanliness and Good Housekeeping Practices in Household Insect Control, by C. R. Twinn (pp. 56–60); The Effects of Temperature and Certain Chemicals on Cheese Mites [*Tyroglyphus farinae* De G.], by G. G. Dustan (pp. 60–67); Experiments Relating to the Control of Armyworm (*Cirphis unipuncta* Haw.) by Poisoned Baits, by A. Kelsall and H. T. Stultz (pp. 67–70); A Note on the Grasshopper Situation in Manitoba in 1937, by A. V. Mitchener (p. 70) (E. S. R., 80, p. 223); The Potato Scab-Gnat [*Pnyxia scabiei* Hopk.] Outbreak in Middlesex in 1937, by A. A. Wood (p. 71); Remarks on External Parasites of Canadian Wild Life, by A. Gibson (p. 71); Some Observations on the Use of Methyl Bromide as a Fumigant, by H. A. U. Monro (p. 72) (see p. 370); and A Summary of the Insect Pest Situation in Canada in 1937, by C. R. Twinn (pp. 72–86) (E. S. R., 80, p. 223).

Annual insect population records, with special reference to the Kansas summary, R. C. Smith. (Kans. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 5, pp. 618–622*).—The author presents a brief report on what is now being done in North America insofar as data are available and discusses the various methods that are being used to gather information on insect populations. Particular reference is made to the Kansas survey (E. S. R., 80, p. 70).

Physiological conditions of cold-hardiness in insects, I. W. Kozhantshikov (*Bul. Ent. Res., 29 (1938), No. 3, pp. 253–262, figs. 4*).—It is concluded that cold-hardiness in insects depends on the physiological state of the organism; the most resistant are the phases in diapause (prepupae of *Crocsus septentrionalis*, eggs of the gypsy moth, and pupae of Acronyctinae); not so hardy are the caterpillars of *Lasiocampa quercus* L. stopped in their development and prepupae of *Agrotis segetum* Schiff.; and practically non-cold-hardy are developing (or growing) insects, viz, the full-grown larvae of *Calliphora erythrocephala* Meig. and the growing caterpillars of the beet webworm and *A. segetum*. The difference in the cold-hardiness of these three groups depends on the specificity of their cellular respiration. A list of 19 references to the literature is included.

Experimental studies in insect parasitism.—VI, Host suitability, G. Salt (*Bul. Ent. Res., 29 (1938), No. 3, pp. 223–246, figs. 3*).—A continuation of the studies reported (E. S. R., 78, p. 228), presented with a list of 46 references to the literature.

The relation of concentration of active ingredient to insecticidal efficiency of dusts, L. M. Smith. (Univ. Calif.). (*Jour. Econ. Ent., 31 (1938), No. 5, pp. 598–602, figs. 4*).—A comparison made of the relative efficiency of different concentrations of insecticidal powders indicates that in certain cases, at least, toxicity or field efficiency is not proportional to the concentration of active principle, and that equal poison applications of various dilutions do not result in equal kills of insects. Details of the study are given in tables and charts.

The ratio of lead to arsenic in spray residues from lead arsenate, G. W. Pearce and A. W. Avens. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 5, pp. 594–597*).—The authors have found that "the ratios of lead to arsenious oxide (Pb/As_2O_3) in residues at harvest from lead arsenate sprays applied under New York State conditions tend to be higher than the ratio in dilead arsenate. This tendency is more pronounced in residues which have been exposed to long periods of weathering. It is less pronounced when oil has been applied with or following the lead arsenate sprays. The ratio of lead to arsenious oxide in residues on fruit washed with hydrochloric acid with and without wetting agents is definitely higher than that in residues on the unwashed fruit."

The control of common red spider and thrips by the use of N,N amyl benzyl cyclohexylamine, C. W. Kearns and C. C. Compton (*Jour. Econ. Ent., 31 (1938), No. 5, pp. 625–630, figs. 3*).—A study made of the insecticidal properties of various derivatives of cyclohexylamine has resulted in the discovery of a compound, namely, N,N amyl benzyl cyclohexylamine, which is highly toxic to the common red spider and the onion thrips. The toxicity of water immiscible liquid was found to be greatly influenced by the type of emulsifier and the ratio of emulsifier to toxicant employed in formulating it in a manner suitable for practical application. A formulation consisting of 70 percent N,N amyl benzyl cyclohexylamine and 30 percent of Santobane A Emulsifier has been found approximately to double the toxicity of the compound as previously reported by Compton and Kearns (E. S. R., 77, p. 520) for red spider infesting roses, and has proved in laboratory and practical tests conducted in commercial greenhouses to be an effective means of controlling red spider and thrips on a variety of greenhouse and ornamental crops.

Toxicological studies of derris: Chronic toxicity of derris, A. M. Ambrose and H. B. Haag. (U. S. D. A. et al.). (*Indus. and Engin. Chem., 30 (1938), No. 5, pp. 592–595, fig. 1*).—In this fourth of a series of papers on the toxicology of *Derris elliptica* and its constituents (E. S. R., 78, p. 816), studies made of its toxicity for rabbits, dogs, and rats are reported. "For rabbits, 60 mg per kilogram and above showed signs of cumulative toxicity. In adult dogs on diets containing 0.04 percent derris no symptoms of toxicity were observed. In young growing dogs on the same diet, the most pronounced effect was the stunting of growth. Derris diets containing less than 0.0312 percent derris had no demonstrable effect on growth of rats. As the concentration of derris in the diet was increased, the inhibition in growth was more marked. Pathologic studies on the tissues of dogs and rats indicated that derris in all concentrations studied was somewhat injurious, the liver being the only organ consistently affected."

The problem of the evaluation of rotenone-containing plants.—IV, The toxicity to Aphis rumicis of certain products isolated from derris root, F. Tattersfield and J. T. Martin (*Ann. Appl. Biol., 25 (1938), No. 2, pp. 411–429, figs. 2*).—In this further contribution (E. S. R., 77, p. 363) an account is given of the preparation and a few of the properties of a compound isolated from the extracts of Sumatra-type derris root. It is shown that a crystalline derivative giving rise to toxicarol on treatment with alcoholic potash, and which may be regarded as its precursor, is largely responsible for the chemical and physical properties which differentiate the Sumatra-type and *Derris malaccensis* resins from those of *D. elliptica.* The toxicities to the bean aphid of rotenone, toxicarol precursor, sumatrol, toxicarol, and the residual resins from the Sumatra-type and *D. elliptica* roots have been determined. In the experiments the toxicity in descending order was rotenone >*D. elliptica* resin >Sumatra-type resin>sumatrol=toxicarol precursor>inactive toxicarol.

The statistical method used in analyzing the insecticidal data is described by W. G. Cochran in an appendix (pp. 426–429).

Some observations on the fumigation of apples with methyl bromide, W. R. Phillips, H. A. U. Monro, and C. E. Allen (*Sci. Agr., 19 (1938), No. 1, pp. 7–20, pl. 1*).—The authors have found that the standard treatment of methyl bromide fumigation is lethal to insects feeding internally in apples. The residue of bromide was so slight as to be harmless to human beings. Under certain conditions, however, methyl bromide in the various ways applied caused both internal and external injury to the apples. If the apples are picked at the proper stage of maturity and are stored for 6 weeks at 32° or 39° F. and standard treatment used, no injury results. It is concluded that the damage is physiological rather than mechanical.

Mothproofing preparations and methods of testing, S. C. Billings. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 5, pp. 616–618*).—A discussion based upon an examination of some 300 commercial mothproofing preparations of various types on the market, made by the Food and Drug Administration.

Progress to date on studies of radio waves and related forms of energy for insect control, T. J. Headlee and D. M. Jobbins. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 31 (1938), No. 5, pp. 559–563*).—This contribution supplements information previously reported (E. S. R., 75, p. 224). Efforts made to secure an improvement in the lethal effect of the electrostatic field for insects by a process of interruption have proved ineffective. "A careful and intensive study of the utilization of the electrostatic field for the destruction of Japanese beetle grubs and eggs in the soil ball of certain kinds of ornamental plants was carried out and led to the conclusion that any soil temperature sufficiently high to insure destruction of the grubs and eggs would do serious, and, in many cases fatal, damage to the plants, the earth balls of which were treated. This result seems to be due to the elimination of the differential heating effect through the presence of the normal amount of moisture in the soil and in the roots of the plant."

Leaf-feeding insects of shade trees, W. B. Becker (*Massachusetts Sta. Bul. 353 (1938), pp. 83, figs. 52*).—Brief summarized, illustrated accounts are given of the important leaf-feeding insects that attack shade trees in Massachusetts. A brief account of tree injury by squirrels, by E. M. Mills (U. S. D. A.), follows (pp. 79, 80).

[Contributions on forest insects] (*Jour. Forestry, 36 (1938), No. 10, pp. 983–986, 998–1018, figs. 4*).—Contributions presented are: Cooperation in Forest Insect Studies Relating to Conservation, by J. J. De Gryse (pp. 983–986); Relation of Insects to Primitive and Present-Day Forests, by S. A. Graham (pp. 998–1004); The Relation of Insects to the Conservation of Farm Woodlots, by R. B. Friend (pp. 1004–1011) (Conn. [New Haven] Expt. Sta.); and The Relation of Insects to Shelterbelt Plantations in the Great Plains, by N. D. Wygant (pp. 1011–1018) (U. S. D. A.).

Control of insects attacking grain in farm storage, R. T. Cotton (*U. S. Dept. Agr., Farmers' Bul. 1811 (1938), pp. II+14, figs. 11*).—A practical summary of information on the more important insects that attack stored grain, with preventive measures and control through fumigation.

Physical ecology of the firebrat (Thermobia domestica (Pack.)), H. L. Sweetman (*Ecol. Monog., 8 (1938), No. 2, pp. 285–311, figs. 3*).—The morphology and biology of the firebrat in its several stages, based upon studies in Massachusetts, is reported.

Grasshopper migration in North Dakota, J. A. Munro and S. Saugstad (*North Dakota Sta. Bimo. Bul., 1 (1938), No. 1, pp. 4, 5, fig. 1*).—In order to secure definite information on the speed and direction of grasshopper dispersal, upward of 100,000 individuals were sprayed with a fast-drying red lacquer and released on July 17, 1938, a few miles west of La Moure in southeastern North Dakota. No ill effects of the treatment appeared among marked grasshoppers kept under cage observations. Two days following release four of the marked specimens, three of which were *Melanoplus mexicanus* and one the differential grasshopper, were recovered at a point 20 miles northwest of the place of release. Subsequent recoveries included only the more migratory form *M. mexicanus*, one specimen of which was found on July 31 215 miles distant and five others from August 2 to 14 at distances of from 86 miles in 16 days to 214 miles in 28 days. The few recoveries verified ranged from north to northwest from the point of release. It is thought that the winds from the south and southeast being warmer than those from other points were more effective for promoting sustained flight of the insects.

A measure of the flight capacity of grasshoppers, J. A. Munro and S. Saugstad. (N. Dak. Expt. Sta.). (*Science, 88 (1938), No. 2290, pp. 473, 474, fig. 1*).—A report of studies of the speed and direction of grasshopper dispersal conducted in the summer of 1938, an account of which is noted above.

Species and distribution of grasshoppers responsible for recent outbreaks, R. L. Shotwell. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 5, pp. 602–610*).—A study made of the relative abundance, by States, of the species of grasshoppers occurring in nine western States during the years 1934, 1935, and 1936 is reported in detail in table form, the results being expressed in percentage of total numbers of specimens collected in each State. The two-striped grasshopper and the differential grasshopper steadily increased in numbers from 1928 to 1931, in which latter year they staged the worst outbreak in the history of South Dakota. From 1933 to 1935 severe drought conditions prevailed and reduced the populations of these two species. During this same period *Melanoplus mexicanus* increased until it reached its peak of abundance in 1934. Outbreaks of grasshoppers under dry conditions spread to States not normally having severe grasshopper outbreaks. It was found that drought has a tendency to reduce populations of some species, whereas other are better able to withstand such conditions because they can survive on the drier native grasses. Changes in weather, food plants, and plant cover from year to year effect changes in the relative abundance of the different species.

The life-history and growth of the cockroach Blatta orientalis Linn., M. A. H. Qadri (*Bul. Ent. Res., 29 (1938), No. 3, pp. 263–276, figs. 7*).—This is a report of studies of the life history of the oriental cockroach, which passes through one pronymphal and six nymphal stages and molts seven times after its exit from the ootheca, accompanied by a list of 33 references to the literature.

Some comparisons of dusts for potato leafhopper control on Long Island, J. B. Skaptason. (Cornell Univ.). (*Amer. Potato Jour., 15 (1938), No. 10, pp. 271–277, figs. 3*).—A report is made of the results obtained from a year's large-scale use of dusts to control the potato leafhopper on Long Island. Improved control was obtained from the application of a pyrethrum-rotenone-sulfur dust to Irish Cobbler and Green Mountain varieties of potatoes. While the increases in yields that resulted may have been caused in part by control of the leafhoppers it is considered unlikely that they can be entirely attributed to such control. A stimulating effect by the pyrethrum or an injurious effect by the sulfur when used alone is suggested. Although copper-lime dust afforded some control of the potato leafhoppers, the pyrethrum-rotenone-sulfur dust was significantly more effective and gave an increase in yield of 43 bu. to the acre when compared with the copper-lime dust.

A contribution to a list of the Aphididae of the Maritime Provinces of Canada, J. C. Burnham (*Canad. Ent., 70 (1938), No. 9, pp. 180–188*).—Seventy-six aphid forms collected in the Maritime Provinces of Canada from 1934 to 1937, inclusive, are noted in this alphabetical list of species.

Studies on the resistance of apple to the woolly apple aphid (Eriosoma lanigerum (Hausm.)), G. W. Underhill and J. A. Cox. (Va. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 5, pp. 622–625, figs. 3*).—Report is made of experiments extending over a 3-yr. period from 1935 and aimed at the determination of the resistance of the roots of certain varieties of apple to the woolly apple aphid. The results, details of which are given in table and graph form, have shown the Northern Spy and Early Harvest varieties to be highly resistant. With the exception of these 2, no high degree of resistance was found in any of the 20 varieties tested.

Different methods of oil applications, W. L. Thompson. (Fla. Expt. Sta.). (*Citrus Indus., 19 (1938), No. 7, pp. 11–14*).—The results obtained from the use of oils in the control of the purple scale on different types of grapefruit trees in the same row and with different types of spray guns are reported in table form. It is shown that leaves most heavily infested with this scale are near the top as well as in the inside center of the tree. On the average, there is a much higher percentage of purple and Florida red scale found on the under surface of the leaves than on the upper surface.

Bibliography of the described life-histories of the Rhopalocera of America north of Mexico, 1889–1937, D. Davenport and V. G. Dethier (*Ent. Amer., n. ser., 17 (1937), No. 4, pp. 155–194*).—In this bibliography the authors attempt to bring up to date the section on Rhopalocera of the 1889 Bibliographical Catalogue of the Described Transformations of North American Lepidoptera, by H. Edwards.[8]

A study of the natural control of the pea moth Cydia nigricana Steph., E. Cameron (*Bul. Ent. Res., 29 (1938), No. 3, pp. 277–313, pls. 2, figs. 11*).—This is a report of studies of *C. nigricana*, one of the principal insect pests of agriculture in Canada, being particularly destructive in the Maritime Provinces, British Columbia, and Ontario. In the last-named Province it has increased to such proportions that the farmers have had to give up growing midseason peas altogether. Following a brief introduction, the biology of this moth, factors of natural control, notes on cultural and chemical methods of control, collection, sorting, and shipment of material, and prospects of biological control in Canada are presented. A list is given of 22 references to the literature.

A field study of the flight, oviposition, and establishment periods in the life cycle of the European corn borer (Pyrausta nubilalis Hbn.) and the physical factors affecting them, I–V, G. M. Stirrett (*Sci. Agr., 18 (1938), Nos. 7, pp. 355–369, figs. 2; 8, pp. 462–484, figs. 3; 9, pp. 536–557, figs. 13; 10, pp. 568–585, figs. 3; 11, pp. 656–683, figs. 2*).—In part 1 (pp. 355–369) of this contribution, following a brief introduction the history and importance of the European corn borer in southern Ontario and methods of study are considered and a list is given of 15 references to the literature; in part 2

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[8] U. S. Natl. Mus. Bul. 35 (1889), pp. 9–37.

(pp. 462–484) the flight of the European corn borer, annual cycle of flight, daily rhythm of flight, and flight to light trap are considered in connection with a list of 32 references; in part 3 (pp. 536–557), the flight of the European corn borer and the influence of the physical factors upon flight, accompanied by a list of 16 references; in part 4 (pp. 568–585), the oviposition and establishment periods, annual cycle of oviposition, daily cycle of oviposition, flight and oviposition, egg mortality and survival, and larval mortality and survival, accompanied by a list of 21 references; and in part 5 (pp. 656–683), the seasonal characteristics of flight, oviposition, and larval establishment, the variations and effects of seasonal climate, the factors causing fluctuations in borer populations, and a summary, accompanied by a list of 11 references.

A preliminary report on a method for controlling earworms by clipping off tips of ears, E. M. Emmert. (Ky. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 573–575*).—A study made in 1937 of the value of clipping the tips of corn ears at different times for control of the corn earworm, the results of which are given in table form, has shown 6 days after pollination as indicated by the drying of the ends of the silks to be the most effective date. This is the result of the removal of a maximum number of the earworm eggs from the silks at a time when few newly hatched worms have had time to penetrate the ears. A few trials were made on reclipping, but the results did not justify the time consumed in a second clipping.

This clipping method is considered to afford the large commercial grower a chance to eliminate most of the worms at the rate of at least an acre per day per man and is much less costly than dusting.

Life history and habits of the cotton bollworms in the Philippines, with suggestions for their control, F. L. Butac (*Philippine Jour. Agr., 9 (1938), No. 2, pp. 137–151, pls. 4*).—This contribution relates particularly to the life history and habits of the spotted bollworm *Earias fabia* Stoll, but includes data on the life history and habits of *E. chromataria* Walk. and the pink bollworm. Tests made in the laboratory and in the open with a 50: 50 mixture, by weight, of derris dust carrying a rotenone content of about 3 per cent and gawgaw indicate that the mixture has a promising value in the control of not only the larvae of *E. fabia* but also other insect enemies of cotton.

Experiments with phenothiazine and mosquito larvae, W. V. King. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 5, pp. 610, 611*).—In tests made of several preparations of commercial phenothiazine on larvae of the southern house mosquito a solution consisting of 1 part (grams) of phenothiazine in 20 parts (cubic centimeters) of sulfonated petroleum oil and 5 parts (cubic centimeters) of acetone was found the most effective. The solution is mixed with water, with which it is readily miscible, before evaporation of the acetone occurs. In laboratory experiments with larval material reared under natural breeding conditions the phenothiazine was fatally toxic at dilutions of 1–2,000,000. Larvae that had been reared on an artificial diet of yeast and dried blood, however, were much less affected by the poison until after they had been removed from the food medium for several hours.

The behavior of the virus of yellow fever in the mosquito Aëdes triseriatus, B. L. Bennett, F. C. Baker, and A. W. Sellards. (Cornell Univ. et al.). (*Science, 88 (1938), No. 2287, pp. 410, 411*).—In experiments conducted with *Aedes triseriatus* (Say) mosquitoes from the region of Ithaca, N. Y., the virus of yellow fever in its ordinary form was transmitted to rhesus monkeys. There was some evidence of attenuation of the virus in this mosquito.

Yellow fever virus in jungle mosquitoes, R. C. Shannon, L. Whitman, and M. Franca (*Science, 88 (1938), No. 2274, pp. 110, 111*).—The evidence here presented incriminates two species of forest-inhabiting mosquitoes, *Aedes leucocelaenus* (D. & S.) and *Haemagogus capricorni* (Lutz), as natural vectors of yellow fever, and indicates that one or more species of sabethine mosquitoes may harbor the virus of the disease without definitely implicating them in actual transmission.

New Bibionidae from British Columbia, D. E. Hardy. (Utah Expt. Sta.). (*Canad. Ent., 70 (1938), No. 10, pp. 207–210, figs. 10*).—Three species and a variety belonging to the dipterous genus *Bibio* are described as new to science.

Effects of acidity, alkalinity, and moisture content of the soil on emergence of Cochliomyia americana C. & P., R. Melvin and R. C. Bushland. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 5, pp. 611–613*).—In this laboratory study of the emergence of the screwworm it was found that the larvae can withstand greater concentrations of potassium hydroxide than of sulfuric acid, but their great tolerance to both chemicals indicates in general that, in nature, the alkalinity and acidity of the soil are factors of negligible importance on the emergence of adults. As the moisture content of the sand increased, the emergence of flies was correspondingly reduced. In the saturated jars only those larvae pupating on top of the sand produced flies. Pupae buried under 1, 2, and 3 in. of saturated sand (400 at each level) failed to produce flies, while good emergence was secured in the controls.

[Parasitic nematodes of the oriental housefly], D. N. Roy and P. K. Mukherjee (*Ann. Trop. Med. and Parasitol., 31 (1937), No. 4, pp. 449–451, fig. 1; 453–456, fig. 1*).—Under the names *Allantonema muscae* and *A. stricklandi* the authors describe two new nematode species found in the body cavity of the oriental housefly at Calcutta.

An unusual type of top-kill of ponderosa pine, K. A. Salman. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 5, pp. 613–616, fig. 1*).—In a study of an unusual type of insect attack on the tops of ponderosa pine trees prevalent in several forested areas in California in 1935, two species of bark beetles of the genus *Pityophthorus*, namely, *P. confinis* LeC. and *P. confertus* Sw. seemed to be primarily responsible. Notes are given on the habits of these species, characteristics of the infestation, and a comparison with other types of top killing.

Trapping sugar cane beetle borers at Kailua, R. H. Van Zwaluwenburg (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 42 (1938), No. 3, pp. 167–173, figs. 3*).—Trapping experiments conducted for a year in two fields at the Kailua Substation with a view to determining the effectiveness of intensive trapping for the New Guinea sugarcane weevil under conditions found on windward Oahu are reported, the details being given in tables and graphs. Their failure to reduce the borer population to any marked extent may have been due to migration of beetles from outside areas, failure of traps to attract borers in competition with broken and rat-eaten cane, or the probably reduced effectiveness of the tachinid parasite under the conditions of the experiments.

Field experiments on the control of wireworms, W. R. S. Ladell (*Ann. Appl. Biol., 25 (1938), No. 2, pp. 341–389, figs. 7*).—This contribution from the Rothamsted Experimental Station deals with an attempt made to determine whether it is possible to test chemical control measures against wireworms by a field technic similar to that used in fertilizer and varietal experimentation. A list of 27 references is included, and the information supplied by the sampling results, by W. G. Cochran, is appended (pp. 383–389).

A method of determining the mean speed of movement of insects in a mass of flour, J. Stanley and B. N. Smallman (*Canad. Jour. Res., 16 (1938), No. 8, Sect. D, pp. 221–224, fig. 1*).—A description is given of a method of determining the mean speed of movement of the adult of the confused flour beetle through a mass of flour.

Investigations into the nutrition of the ash-bark beetle Hylesinus fraxini Panz., H. S. Hopf (*Ann. Appl. Biol., 25 (1938), No. 2, pp. 390–405*).—The results of investigations of the enzymes of the alimentary canal and a comparative analysis of ash barks and the frass of *H. fraxini* are reported. A list of 33 references to the literature is included.

A new anobiid beetle from Alaska, W. S. Fisher (*Jour. Wash. Acad. Sci., 28 (1938), No. 1, pp. 26, 27*).—Under the name *Hadrobregmus destructor* an anobiid beetle taken at Sitka, Alaska, in July 1937 is described as new. The beetle was found working in the supporting columns of and in wooden articles in a museum.

Specularius erythrinae, a new bruchid affecting seeds of Erythrina (Coleoptera), J. C. Bridwell (*Jour. Wash. Acad. Sci., 28 (1938), No. 2, pp. 69–76*).—Under the name *S. erythrinae* n. g. and sp. a description and an account are given of a bruchid found attacking the seeds of species of *Erythrina* in Africa, India, and Sumatra.

A new species of Gasterocercodes Pierce that attacks the cotton plant in Brazil [trans. title], E. J. Hambleton (*Rev. Ent., 7 (1937), No. 4, pp. 345–350, figs. 2*).—Under the name *G. brasiliensis* n. sp. the author describes a weevil that is the source of injury to cotton in Brazil through its boring in the roots and stalks. It is said to be closely related to *G. gossypii* Pierce that occurs in Peru and Equador.

The biology of the cotton borer Gasterocercodes brasiliensis Hambleton in Brazil (Coleoptera: Curculionidae) [trans. title], E. J. Hambleton (*Arch. Inst. Biol. [São Paulo], 8 (1937), pp. 47–106, pls. 12, figs. 11; Eng. abs., pp. 101–105*).—A report is made of investigations of the life history and habits of the curculionid weevil *G. brasiliensis*, known since 1905 as a pest of cotton in Brazil and described by the author in 1937 as a new species (above noted). Since 1916 (E. S. R., 38, p. 54) it has been referred to in the literature under the name *G. gossypii* Pierce, a closely related form that occurs in Peru and Equador. This borer causes serious damage throughout practically the entire cotton area of the State of São Paulo, where the study was conducted. Technical descriptions of the adult and immature stages are included.

The true host plants are confined exclusively to genera of the family Malvaceae. "The adults feed at first on the stems and tender foliage of the growing plants but later confine their feeding almost entirely to the stalks near the soil surface. The young larvae bore into the center of the stem or root, causing death of the plant. As the plants become older, larval attack is confined almost entirely to the area between the bark and the woody tissue. Feeding galleries are made in all directions, often encircling the plant causing it to wither and die. In seriously infested plants, egg laying occurs in the aerial parts and larval feeding is confined principally to the pith. It may occur in green bolls, and in these feeding is limited to the pericarp. Infested plants may wilt and die rapidly during hot weather or their foliage becomes weakened, turns pale to reddish bronze in color. Those that resist attack often fail to show apparent external symptoms in the aerial parts, but the underground stem and roots often present large swellings resulting from a proliferation at the point of attack, or they may become corkylike and the bark crack open."

The average time required for 38 individuals to complete their entire life cycle from egg to adult was 73.68 days during the period November to August.

Natural enemies are present during practically the entire season and are effective in reducing weevil population.

Notes on the biology of the cotton borer in Pernambuco, Brazil, L. I'YENSON (*Jour. Econ. Ent., 31 (1938), No. 5, pp. 553–557, figs. 4*).—Observations of a variety of *Gasterocercodes brasiliensis* Hambl., one of the major pests of cotton in the northeastern States of Brazil and apparently native to the region, are reported. This variety of the species, a description and studies of which species by Hambleton are above noted, was first reported in São Paulo in 1905 but was not identified until 1921, at which time it was supposed to be *G. gossypii* (E. S. R., 38, p. 54). Insecticide experiments indicate that paris green may be used with some hope of success in killing the adult cotton borers in the fields. The pest is relatively free of predators and parasites, and cultural control methods are considered the most promising.

[Apicultural contributions] (*Jour. Econ. Ent., 31 (1938), No. 5, pp. 568–577, figs. 3*).—Apicultural contributions presented include the following: Further Developments in Equipment for Heating and Bottling Honey, by E. J. Anderson (pp. 568–570) (Pa. State Col.); Environmental Factors and Size Variations in Honeybee Appendages, by S. E. McGregor (pp. 570–573), and Observations on Resistance of Some Dark Races of Honeybees to European Foulbrood, by C. E. Burnside (pp. 573–575) (both U. S. D. A.); and Vitamin E Content of Royal Jelly and Bee Bread, by M. H. Haydak and L. S. Palmer (pp. 576, 577) (Minn. Expt. Sta.).

Bactericidal activity of "royal jelly" of the honey bee, C. S. MCCLESKEY and R. M. MELAMPY. (La. State Univ. and U. S. D. A.). (*Jour. Bact., 36 (1938), No. 3, p. 324*).—The authors found royal jelly, the secretion of the pharyngeal glands of the worker honeybee which is the food of the queen, to have pronounced bacteriostatic and bactericidal properties. "*Escherichia coli* and *Eberthella typhosa* are inhibited by a concentration of 1–50 of the natural jelly in nutrient broth; *Staphylococcus aureus* and *Bacillus metiens* by a concentration of 1–100. The germicidal activity is markedly influenced by temperature. When 1 cc of broth culture was added to 1 cc of a 1–5 dilution of royal jelly at 43° to 45° C., the organisms were destroyed in 15 sec.; at 23° to 25°, in from 10 to 30 min.; while at 5° the organisms survived for 2 days. The bactericidal potency was rapidly reduced by neutralization of the natural acidity of pH 4.4 to 4.6. Sterilization of test cultures required only a few minutes at pH 4.6 (25°), but required 2 days at pH 7.0. The bactericidal capacity was largely lost when royal jelly was filtered through paper; it was found in the sediment after centrifugation. The active principle was removed from royal jelly by extraction with ethyl alcohol and with acetone. From these extracts, crystals were obtained which seemed to possess the bactericidal principle."

Is there a best race of bees? O. W. PARK. (Iowa Expt. Sta.). (*Amer. Bee Jour., 78 (1938), Nos. 8, pp. 366–368, 377, figs. 2; 9, pp. 414–417, figs. 2*).—A practical contribution.

Presence of host keeps parasites alive in captivity, G. N. WOLCOTT. (P. R. Col. Expt. Sta.). (*Science, 87 (1938), No. 2259, p. 352*).—The author reports success in the shipment of the changa wasp parasite *Larra americana* Sauss. from Brazil to Puerto Rico in its attempted introduction by inclosing parasitized changas in a screened container inside a larger box containing the wasp. This is thought to be the first instance of the mere presence of the host serving to keep introduced parasites alive while en route between the point of collection and that of release.

A new species of Apanteles (Hym.: Brac.) bred from Carposina adreptella attacking raspberry in New Zealand, D. S. WILKINSON (*Bul. Ent.*

Res., *29* (*1938*), *No. 3*, *pp. 247–249*, *figs. 3*).—Under the name *A. carposinae* a description is given of a new form reared from *C. adreptella* Walk., a tineid known in New Zealand as the raspberry budmoth, the natural host plant of which is probably *Rubus australis.*

A report on some miscellaneous African Encyrtidae in the British Museum, H. Compere. (Calif. Citrus Expt. Sta.). (*Bul. Ent. Res.*, *29* (*1938*), *No. 3*, *pp. 315–337*, *figs. 9*).—Twelve new species of Encyrtidae, mostly parasites of the Coccidae, are described in this contribution.

A new European species of Epiurus parasitic on a leafmining sawfly (Hymenoptera: Ichneumonidae), R. A. Cushman (*Jour. Wash. Acad. Sci.*, *28* (*1938*), *No. 1*, *pp. 27*, *28*, *fig. 1*).—Under the name *E. foliae* a parasite originally reared in Europe from mines of the sawfly leaf miner of birch (*Phyllotoma nemorata* (Fall.)) is described as new. The parasite is said to have been released in areas in New England infested by this sawfly.

Thelyotokous parthenogenesis in Cephus cinctus Nort. (Hymenoptera: Cephidae), C. W. Farstad (*Canad. Ent.*, *70* (*1938*), *No. 10*, *pp. 206*, *207*).—The author's study of the wheat-stem sawfly, which has recently become established as a serious pest of wheat in the Lethbridge area of southern Alberta, indicates that it is thelyotokously parthenogenetic, no males having as yet been found in that Province.

Occurrence of a sawfly, Acantholyda erythrocephala L., in New Jersey, F. A. Soraci (*Jour. N. Y. Ent. Soc.*, *46* (*1938*), *No. 3*, *p. 326*).—Note is made of the finding of the sawfly *A. erythrocephala* on red and Austrian pines in a nursery at Franklin Lakes, Oakland, N. J., in June 1937 and on white pine at several other points in the State. This is said to be the second time that the species has been taken in the United States, having first been found at Chestnut Hill, Pa., in May 1925. Reports during 1938 indicate a wide distribution in New Jersey.

An annotated list of the insect fauna of Douglas fir (Pseudotsuga mucronata Rafinesque) in the northern Rocky Mountain region, W. D. Bedard. (U. S. D. A.). (*Canad. Ent.*, *70* (*1938*), *No. 9*, *pp. 188–197*).—Record is made of insects that have been found in or on Douglas fir in the northern Rocky Mountain region, including parasites and associates, by the Forest Insect Field Laboratory at Coeur d'Alene, Idaho. Of the 153 species listed, 102 were collected by the author during the course of a study of the Douglas fir beetle.

The northern fowl mite Liponyssus sylviarum C. & F. 1877: Investigations at Macdonald College, Que., with a summary of previous work, D. Cameron (*Canad. Jour. Res.*, *16* (*1938*), *No. 8*, *Sect. D*, *pp. 230–254*, *fig. 1*).—A review of the literature on *L. silviarum* is followed by a discussion of the generic name for the species, geographical distribution with hosts in systematic order, morphology, life history, and habits, economic significance, and control. A list of references of 59 titles is included.

A key to the genera of chiggers (mite larvae of the subfamily Trombiculinae) with descriptions of new genera and species, H. E. Ewing. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, *28* (*1938*), *No. 6*, *pp. 288–295*, *fig. 1*).—This contribution includes notes on host relationships, generic structural characteristics, a key to the genera of Trombiculinae based on larval characters, and descriptions of four new genera and two new species.

Family names in the order Araneae, B. J. Kaston. (Conn. [New Haven] Expt. Sta.). (*Amer. Midland Nat.*, *19* (*1938*), *No. 3*, *pp. 638–646*).—A list of the family names of spiders and their synonyms, arranged alphabetically, with a reference to the original description, is presented.

A synopsis of the flagellate genus Cochlosoma Kotlán, with the description of two new species, B. V. Travis. (Iowa Expt. Sta., U. S. D. A., et al.). (*Jour. Parasitol., 24 (1938), No. 4, pp. 343–351, figs. 11*).—Three species of the genus *Cochlosoma*, erected in 1923 to include a peculiar flagellate, *C. anatis*, found in the intestines of European domestic ducks; *C. picae* n. sp, found in the cloaca of an American magpie (*Pica pica hudsonia*) taken at Bliss, Idaho; and *C. turdi* n. sp., found rather numerously in the cloaca of an eastern robin (*Turdus migratorius migratorius*) collected at Ames, Iowa, are recognized. *C. rostratum*, described by Kimura in 1934 (E. S. R., 72, p. 261) from domestic ducks in North America, is believed to be a synonym of *C. anatis*.

Aplectana gigantica (Cosmocercidae), a new species of nematode from Rana pretiosa, O. W. Olsen. (Minn. Expt. Sta.). (*Amer. Micros. Soc. Trans., 57 (1938), No. 2, pp. 200–203, figs. 9*).

Morphology, bionomics, and taxonomy of the cestode Dipylidium caninum. C. E. Venard (*Ann. N. Y. Acad. Sci., 37 (1938), pp. 273–328, figs. 57*).—The literature relating to the larval and adult stages of the dog and cat tapeworm (*D. caninum*), represented by a four-page list of references, is reviewed. A method by which the life cycle was completed under experimental conditions is described, and observations on the morphology and bionomics of the larval and adult stages are reported. Data on normal variation in adults developed from the eggs of a single gravid proglottid form the basis for a diagnostic description of *D. caninum* and permit an evaluation of the species that have been described for this genus, of which three are accepted as valid.

ANIMAL PRODUCTION

[Livestock investigations in Utah] (*Utah Sta. Bul. 282 (1938), pp. 43, 44, 48–60, 69, 113, figs. 8*).—Fifty years' accomplishment in animal husbandry and range management research are briefly reviewed. Particular mention is made of those studies dealing with the composition, digestibility, and feeding value of alfalfa as a forage crop for livestock; the utilization of sugar beet byproducts in livestock rations; mineral deficiency of range plants and the value of mineral, particularly phosphorus, supplements; the value of concentrates for wintering sheep on range; rations and feeding practices for fattening lambs and the sheep breeding flock; the utilization of various species of range plants by grazing animals; a comparison of roughages for dairy cattle; the use of roughage rations for milking cows; the value of improved pastures; milk skimming and cheese ripening; incubation studies; factors affecting egg production; a comparison of grains and sources and levels of protein and calcium for laying hens; and turkey feeding investigations.

Digestible nutrients and metabolizable energy in certain silages, hays, and mixed rations, F. W. Christensen and T. H. Hopper. (N. Dak. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 7, pp. 477–512*).—The results of a large number of analyses and of digestion and metabolism trials with both sheep and steers for the various individual roughages and mixed rations are summarized.

In general, the fresh sweetclover, sunflowers, and corn at the time of ensiling averaged somewhat higher in nitrogen-free extract but lower in ash, crude protein, crude fiber, and ether extract than the silages prepared from them. The percentage of total nitrogen represented by protein nitrogen ranged considerably higher in the fresh material than in the resulting silage. On a dry-matter basis, sweetclover silage, corn silage, and sunflower silage contained an average of 16.2, 5.3, and 4.8 percent of digestible crude protein and 56.8, 69.7, and 47.7 percent of total digestible nutrients, respectively. Mixing dry oat straw and green sweetclover (1:5.5) at the time of ensiling reduced the crude protein 56 percent and the total digestible nutrients 37 percent in the silage as compared with straight sweetclover silage (dry basis). The digestibility of sweetclover silages and hays closely resembled that of alfalfa hay, the former averaging slightly higher in digestible crude protein and total digestible nutrients. Corn silage proved most palatable, followed in order by sweetclover silage and sunflower silage. Based on the apparent digestibility of linseed meal and wild oats when each was fed in combination with roughages, the former contained 32.9 percent of digestible crude protein and 75.8 percent of total digestible nutrients and the latter 9.6 percent of digestible crude protein and 61.6 percent of total digestible nutrients. The average of 25 individual determinations with roughages indicated a yield of 1.737 therms of metabolizable energy per pound of digestible organic matter and 1.67 therms per pound of total digestible nutrients, and 21 determinations with mixed rations showed a value of 1.767 therms per pound of digestible organic matter and 1.689 therms per pound of total digestible nutrients.

The digestibility and feeding value of apple and apple-alfalfa silage, J. C. KNOTT, H. K. MURER, R. E. HODGSON, and E. L. OVERHOLSER (*Washington Sta. Bul. 362* (*1938*), *pp. 20, figs. 2*).—The results of two trials with apple silage and three trials with apple-alfalfa silage are reported. Silages from whole and pulped apples had pH values of 3.8 and 4.5, respectively. Excessive loss through drainage juice occurred in each case, and the resulting silages were high in moisture (88 percent from the pulped apples). These silages were palatable to dairy cows but caused off-flavored milk when fed shortly before milking. A mixture of 60 percent apples and 40 percent freshly cut alfalfa gave a palatable silage with a pH of 4.4 and with practically no loss from drainage. A mixture of 80 percent apples and 20 percent alfalfa hay gave a palatable silage which ranged from 3.7 to 3.9 pH. There was a loss of approximately 13 percent dry matter, 7 percent each of protein and fiber, 31 percent ether extract, 17 percent nitrogen-free extract, and 3 percent ash during ensiling, with over 16 percent of the dry matter loss attributable to carbon dioxide evolved. After 48 hours' storage this silage was practically in a carbon dioxide atmosphere. Coefficients of digestibility determined in trials with sheep were: Dry matter 58 percent, crude protein 52, crude fiber 49, ether extract 47, and nitrogen-free extract 70 percent, which on a dry-matter basis were equivalent to an average digestible crude protein content of 5.4 percent and total digestible nutrient content of 57.2 percent. The apple-alfalfa silage compared favorably with sunflower silage in feeding trials with milking cows.

The composition and apparent digestibility of pea vine silage, sun cured pea vines, and artificially dried pea vines, R. E. HODGSON and J. C. KNOTT (*Washington Sta. Bul. 364* (*1938*), *pp. 12*).—The digestibility of each of these products was determined in trials with sheep (three per trial) in 1935 and again in 1937. On a dry-matter basis the pea vine silage, sun-cured vines, and artificially dehydrated vines contained an average of 7, 11.5, and 6.8 percent of digestible crude protein and 57.8, 63.8, and 59.4 percent of total digestible nutrients, respectively. Sun curing appeared to be the most effective method of preserving the nutrients in pea vine forage, particularly from the standpoint of its protein value.

A proposed method for determining the uniformity of ground feeds, E. A. SILVER (*Agr. Engin., 19* (*1938*), *No. 6, p. 258*).—The proposed method, developed by committees of the American Society of Agricultural Engineers and the American Society of Animal Production working jointly, provided for the usual modulus value of feeds and in addition an expression of the degree of uniformity of the sample based on the ratio of feed particles collected on the three coarser screens, the fourth and fifth screens, and the two finer screens and pan. By summing the percentage of particles in each of these three screen groups, dividing each sum by 10, and converting to the closest whole number, the possible range of ratios is from 10:0:0 to 0:0:10, with a possibility of 66 combinations between these extremes. Under this system a ratio such as 3:4:3 would represent an extremely variable sample, while 0:10:0 would indicate great uniformity in size of particles.

Inspection of commercial feeding stuffs, 1938, T. O. SMITH and H. A. DAVIS (*New Hampshire Sta. Bul. 308 (1938), pp. 92*).—This is the usual report of the guaranteed and found analyses of 471 brands of feeding stuffs collected during the year ended June 1938 (E. S. R., 78, p. 677).

The utilization of energy producing nutriment and protein as affected by the plane of protein intake, E. B. FORBES, L. VORIS, J. W. BRATZLER, and W. WAINIO. (Pa. Expt. Sta.). (*Jour. Nutr., 15 (1938), No. 3, pp. 285–307, figs. 5*).—Continuing this study (E. S. R., 75, p. 722), diets containing protein levels of 25, 30, 35, and 45 percent were so fed that the entire series covered a range of variation of protein contents from 10 to 45 percent. Corresponding to further increases in protein levels from 25 to 45 percent, which range was above the optimum proportion of protein in the diet, there was a slight decrease in rate of gain in weight, energy nitrogen, and fat, and in fat gain per gram of nitrogen gain; also the nutritive balances of the diets as sources of energy were slightly impaired as shown by the decrease in the quantity of energy utilized for body gain. As the protein increased from 10 to 45 percent there was a slight decrease in the proportion of food nitrogen appearing in the feces, an increase in the proportion occurring in the urine, and, above 15 percent, a marked decrease in the proportion utilized for body gain. The basal energy metabolism was not materially affected by the plane of protein intake.

Cellular changes in the anterior hypophyses of vitamin-A deficient rats, T. S. SUTTON and B. J. BRIEF. (Ohio Expt. Sta. and State Univ.). (*Endocrinology, 23 (1938), No. 2, pp. 211–215*).—Vitamin A-deficient diets caused a significant increase in the basophilic cells in the anterior lobe of the hypophysis of both male and female rats similar to the effects caused by castration.

Cattle feeding, 1932–33, 1933–34, 1935–36, J. H. SKINNER and F. G. KING (*Indiana Sta. Bul. 429 (1938), pp. 15*).—The results of three series of feeding trials with fattening beef calves are summarized. A comparison of corn, clover hay, and corn silage without protein supplement and in combination with whole soybeans or cottonseed meal showed that the addition of a protein supplement produced more rapid and more economical gains, higher finish, and higher net returns. Cottonseed meal proved superior to whole soybeans as a supplement, both from the standpoint of rapidity of gains and net returns. In two trials comparing whole soybeans and roasted soybeans, roasting the beans did not improve their value as a supplement to corn, clover hay, and corn silage. In the third series, planned to determine the value of limestone as a supplement to native feeds for fattening cattle, the addition of limestone did not increase the value of the corn-cottonseed meal-clover hay-corn silage ration, but when whole soybeans replaced cottonseed meal the use of limestone was justified. Substituting limestone and oat straw for clover hay in the above cottonseed meal ration reduced the rate of gain and decreased the selling value of the fat cattle.

Cattle feeding, 1934–1935: Meat meal tankage, J. H. Skinner and F. G. King (*Indiana Sta. Bul. 428* (*1938*), *pp. 7*).—In a feeding trial involving three comparisons between meat meal tankage and cottonseed meal as protein supplements in cattle fattening rations, the tankage rations produced as rapid and as economical gains and slightly better average finish and higher dressing percentage than the comparable rations containing cottonseed meal. Cattle showed an aversion to tankage for the first few days so that care had to be exercised in introducing this ingredient into the ration. However, it was soon consumed with relish. A single comparison between the tankage and soybeans showed the former to be a less efficient supplement as measured by rate and cost of gain but more efficient as measured by finish, dressing percentage, and net profit per head.

Cattle feeding, 1936–1937: Cane molasses, J. H. Skinner and F. G. King (*Indiana Sta. Bul. 430* (*1938*), *pp. 8*).—In a trial involving seven lots of grade Hereford 2-year-old steers, cane molasses was fed in various combinations. When used to replace a part of the corn for full-fed cattle or to wholly replace corn for steers receiving chiefly roughage, the molasses was slightly lower in nutritive value than an equal weight of corn as measured by rate of gain and finish of the cattle. However, the feeding of molasses proved profitable under the conditions described at the lower price prevailing for molasses. A mixture of ground oats and cane molasses in combination with cottonseed meal, clover hay, and corn silage produced as rapid and more economical gains than corn but failed to give a satisfactory finish, resulting in a materially lower net return per head.

Utilizing blue stem grass in fattening yearling steers, C. W. McCampbell. (Kans. Expt. Sta.). (*Cattleman, 25* (*1938*), *No. 2, pp. 15–17*).—The results are summarized for 12 feeding trials designed to determine the best methods for wintering calves, utilizing bluestem grass pasture with steers, and finishing yearling steers for market. Maximum returns were secured from the finished steers when they were well wintered as calves, i. e., fed corn, cottonseed meal, silage, and alfalfa hay, then grazed on bluestem grass for 90 days after May 1 without a grain supplement, and finally full-fed for 100 days in dry lot. Under this plan the calves gained from 200 to 250 lb. during the wintering phase, from 90 to 100 lb. during the grazing, and from 250 to 275 lb. during full-feeding. Wintering and grazing steers as above, then full-feeding grain on pasture for an additional 40 to 60 days, followed by 40 to 60 days of finishing in dry lot, gave only slightly lower net returns than the above method.

Corn versus barley for fattening steers, T. H. Hopper, E. J. Thompson, F. C. Daugherty, A. Severson, A. J. Pinckney, and L. L. Nesbitt (*North Dakota Sta. Bul. 290* (*1938*), *pp. 18*).—Two groups of 27 long yearling Hereford steers each were compared over a 111-day fattening period. One group received a full feed of cracked shelled corn, the other a full feed of ground barley, with both lots receiving prairie hay and bonemeal free-choice and approximately 1 lb. of lineseed meal per head daily. The corn ration proved more palatable throughout the trial. The corn and barley groups made average daily gains of 2.08 and 1.95 lb. per head and required 89 and 111 lb. of digestible crude protein and 851 and 779 lb. of total digestible nutrients per 100 lb. of gain, respectively. The corn group showed more uniformity of covering and evenness of finish, but both observation and chemical analyses of rib cuts indicated that the barley group was fatter. There was no observed difference in the color of the lean and the color, quality, and hardness of the fat between the two groups.

Effects of improved pasture on superfine Merino wool, J. A. Dumaresq (*Tasmanian Jour. Agr., 9 (1938), No. 3, pp. 113–122, figs. 8*).—In the trials reported, native unimproved pastures and improved pastures of subterranean clover and ryegrass were compared. Sheep on the improved pasture stocked at the rate of 3 per acre gained about 11 lb. more per head and clipped 2 lb. more wool per head in 12 mo. than those on unimproved pasture stocked at the rate of 1 head per acre. The yield of grease wool was 31.5 lb. and 8 lb. per acre for improved and native pasture, respectively. Sheep on native pasture produced slightly brighter fleeces of about 1 grade higher spinning count. No difference in character or staple length of wool was observed.

Relative efficiency of limited and full-feeding for fattening pigs in dry lot, J. M. St. Pierre. (Cornell Univ.). (*Bonne Terre, 19 (1938), No. 4–5, pp. 147–209, pls. 7; Fr. abs., pp. 151–157*).—The results of two feeding trials, one each with spring and fall pigs, are reported in which groups were full-fed and approximately three-fourths and one-half full-fed, respectively. In both trials the medium-fed lots required slightly less feed per unit of gain than the full-fed group. However, the small saving of approximately 10 lb. of grain per 100 lb. of live weight gain was much more than offset by the greater labor requirement, housing costs, etc., necessitated by the longer feeding period required by the medium-fed groups. The lots fed at the lowest level made the slowest and most expensive gains. One additional lot half-fed for 10 weeks and then full-fed to the end of the fattening period also made relatively expensive gains and was not ready for market before the medium-fed group.

Sensory neuron degeneration in vitamin deficiency: Degeneration of the posterior columns of the spinal cord, peripheral nerves, and dorsal root ganglion cells in young pigs fed a diet containing thiamin (B_1) and riboflavin but otherwise deficient in vitamin B complex, M. M. Wintrobe, D. M. Mitchell, and L. C. Kolb. (Coop. U. S. D. A.). (*Jour. Expt. Med., 68 (1938), No. 2, pp. 207–220, pls. 4, figs. 4*).—In this study conducted by Johns Hopkins University young pigs fed a synthetic diet remained healthy and made satisfactory growth so long as a liberal amount of yeast was included in the diet. When the quantity of yeast was gradually reduced to a very low level and thiamin (vitamin B_1) and riboflavine were given in its place, the growth of pigs decreased or ceased, their general condition became impaired, and marked ataxia without motor weakness developed. This condition was accompanied by a severe degeneration of the posterior columns of the spinal cord, the dorsal root ganglion cells, and the peripheral nerves. Tissues other than those of the nervous system were either normal or showed only the results of secondary infection.

The complete dog book (*New York: Amer. Kennel Club, [1938], rev., pp. XVII+749, pls. 112, figs. 35*).—Included in this book are chapters on the care, handling, and feeding of dogs, by E. R. Blamey, and historical sketches, descriptions and standards of points, and illustrations of over 100 breeds of dogs, compiled by C. T. Inglee.

The new book of the dog, E. C. Ash (*London: Cassell & Co., 1938, pp. XXII+534, pls. 28, figs. 69*).—The principal topics of discussion in this comprehensive guide are the domesticated dog and its origin, the classification of dogs, the physiology of a dog, Mendelism, color breeding, the practical side of breeding, pedigree, pedigree dog breeding and type—the most important winners and their relationship, the commercial side of breeding, the dog on show, and the treatment of the dog in ailments, diseases, and accidents.

Effect of some factors on the body temperature of hens, B. W. Heywang. (U. S. D. A.). (*Poultry Sci., 17 (1938), No. 4, pp. 317–323, fig. 1*).—In this study at the Southwest Poultry Experiment Station, Glendale, Ariz., it was found that when air temperatures exceeded 86° F. an appreciable increase in the body temperature of hens taken between 3 and 5 p. m. accompanied further increases in air temperature, the increases in body temperature being greater in closely confined hens than in those in open pens. On very hot days the average body temperature between 8 and 10 a. m. tended to decrease as the body temperature between 3 and 5 p. m. increased, and this difference was greater in the closely confined hens. Laying hens tended to have slightly higher average body temperatures than poor or nonlaying hens. However, good layers had approximately the same body temperature during laying and nonlaying periods. A pronounced diurnal variation in body temperature of hens was observed, the lowest temperatures occurring about midnight and the highest temperatures at 4 p. m., with the most rapid change occurring between 6 and 8 p. m. Highest body temperatures corresponded with highest air temperatures, but the lowest body temperature did not occur during the coolest hours of the day. The extremes of body temperature recorded for healthy nonbroody hens were from 103.2° to 110.4°.

Feeding for winter egg production, G. P. GOODEARL (*North Dakota Sta. Bimo. Bul., 1 (1938), No. 1, pp. 7–10*).—The relative value of whole grains v. a moist fleshing mash and whole grains as supplements to a well balanced dry laying mash for laying pullets was determined in trials with groups of Rhode Island Red and White Leghorn pullets. There was little difference in the rate of egg production, percentage gain in weight, or mortality for either breed on the two types of rations. The use of the moist fleshing mash materially decreased the consumption of whole grains and decreased somewhat the consumption of dry mash. The feed cost per dozen eggs was identical under the two systems of feeding for Rhode Island Reds, but White Leghorns showed a definite advantage in favor of the heavy feeding of whole grain.

Metabolism body size and age in baby chicks, M. KLEIBER. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 5, pp. 793–796, fig. 1*).—Two series of respiration trials were conducted on fasting baby chicks from 5 to 20 days of age. A steady increase in metabolic rate with increasing age was noted. Based on the extrapolated rate of birth this amounted to from 0.2 to 1 percent per day per unit of body weight, 2 percent per day per kilogram$^{3/4}$, and 3 percent per unit of surface area. Evidently baby chicks deviated from the general rule which is valid for the relation of body size and metabolism in mature homeotherms.

The effect of environmental temperature on mortality, rate of growth, and utilization of food energy in White Leghorn chicks, C. F. WINCHESTER and M. KLEIBER. (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 7, pp. 529–544, figs. 3*).—Groups of 5 chicks each were raised from 5 to 14–16 days of age at controlled environmental temperature of 16°, 18°, 21°, 35°, and 38° C. All chicks had free access to a ration considered qualitatively complete.

Three chicks at 16° and two at 18° died, indicating that these temperatures approached the lowest limit of environmental temperature. No deaths occurred at the other temperatures. Food consumption under these conditions was approximately a linear negative function of environmental temperature. Temperature exerted a pronounced effect on the composition of the body substances gained. Greatest fat storage occurred at 38°, while no fat was stored at 18°. However, fat storage per gram increase in weight at 16° was only slightly lower than that at 35° or 38°. Protein gains per gram of body weight were greatest at 16° and lowest at 38°. The absolute increase in protein in the chick body was lowest at 38°, slightly greater at 16°, and greatest still at the intermediate temperatures. Heat production expressed as Calories per day per kilogram of weight to the seventy-five hundredths power was greatest (266 Calories) at 18° and lowest (121 Calories) at 38°. The efficiency of energy utilization from 5 to 12 days expressed as a percentage of the available food energy was 20, 15, 23, 36, and 36 at 16°, 18°, 21°, 35°, and 38°, respectively.

The influence of summer temperatures on the rate of growth of chickens, H. L. Kempster. (Mo. Expt. Sta.). (*Poultry Sci., 17 (1938), No. 4, pp. 259–263, figs. 4*).—A comparison of the average growth rates of groups of chicks hatched February 2, March 1, March 29, and April 25 showed material differences in the shape of the growth curves depending on the date of hatching and the temperature prevailing during the growing season. The earlier hatched birds grew at a more rapid rate than later hatched birds during the first 20 weeks. High maximum temperatures that prevailed during the summer markedly retarded the growth rate of the pullets, the smaller chicks being less affected by these periods of extreme heat. This suggests the need of giving proper interpretation to "weight increase" data.

A radiological study of the development of the fowl to six weeks of age on a mineral deficient ration, H. E. LeMasurier and H. D. Branion (*Poultry Sci., 17 (1938), No. 4, pp. 270–275, figs. 8*).—The growth and skeletal development of two groups of chicks, one on a mineral-sufficient and the other on a mineral-deficient diet were compared to 6 weeks of age. Two entirely different types of birds were found in the mineral-deficient group. One was a small bird which developed a comparatively normal skeleton comparable in development to that of a bird of the same weight fed on a normal diet and the other a moderately large bird that had grown at the expense of its skeletal tissue and which showed typical rachitic lesions, the severity of rickets being directly in proportion to the amount of growth achieved.

The relation of the mineral supplement consumption to the normal skeleton development as judged by X-ray examination of various breeds of fowl to six weeks of age, H. E. LeMasurier and H. D. Branion (*Poultry Sci., 17 (1938), No. 5, pp. 381–389, figs. 4*).—In a further study, male and female chicks of the New Hampshire, Barred Plymouth Rock, and White Leghorn breeds and Brown Leghorn × Barred Plymouth Rocks cross-breds fed a well balanced ration with free access to minerals were examined by X-ray at intervals to 6 weeks of age. Radiologically there was no significant difference between the skeletal development of birds belonging to different breeds and sexes except that heavier birds developed heavier frames, the size of the skeleton being relative to the weight of the breed and sex. The mineral consumption was proportional to the extent of skeletal development, depending upon the weight, sex, and pedigree of the birds. The cross-breds utilized minerals more efficiently than the purebreds.

The effect of manganese, zinc, aluminum, and iron salts on the incidence of perosis in chicks, W. M. Insko, Jr., M. Lyons, and J. H. Martin. (Ky. Expt. Sta.). (*Poultry Sci., 17 (1938), No. 4, pp. 264–269*).—Two series of experiments in which the basal diets of chicks were variously supplemented with calcium and phosphorus, iron, aluminum, zinc, and manganese gave evidence that manganese supplied at the rate of 30 p. p. m. exerted a marked protective action against slipped tendon in growing chicks even at high levels of calcium and phosphorus intake. The inclusion of 30 p. p. m. each of aluminum and zinc showed no protective action against slipped tendon, but rather increased the incidence of this disorder when the ration contained 0.61 percent of calcium, 0.49 percent of phosphorus. and 4.5 p. p. m. of manganese.

Vitamin A deficiency in chicks fed purified rations containing cod liver oil, H. R. BIRD and J. J. OLESON. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 5, pp. 870, 871*).—Recent experiments revealed that certain lesions occurring in a type of chick paralysis previously described by Elvehjem (E. S. R., 77, p. 838) were very similar to those occurring in uncomplicated vitamin A deficiency. Synthetic basal diets containing 2 percent of medicinal-grade cod-liver oil but deficient in vitamin B_4 resulted in a high percentage of chick paralysis and a loss of equilibrium in chicks. Administration of 20 mg of Oleum Percomorphum or a water suspension of 0.4 mg of carotene weekly per chick completely prevented the loss of equilibrium and staggering gait but did not decrease the occurrence of leg paralysis, indicating that loss of equilibrium is not a part of the vitamin B_4 syndrome but is caused by complicating vitamin A deficiency. Destruction of vitamin A evidently occurred in the mixed diet at room temperature, since this disorder was eliminated by the administration twice weekly of standardized vitamin A concentrates directly to the chicks on the basal diet.

Vitamin E and avian neurolymphomatosis, R. K. COLE. (Cornell Univ.). (*Science, 88 (1938), No. 2282, pp. 286, 287*).—Of 41 experimental birds showing clinical symptoms of fowl paralysis, 10 received intraperitoneal injections of wheat germ oil, 21 were fed the oil, while 10 controls received none. Eight of those receiving injections, 14 of those fed the oil, and 7 of the controls at autopsy showed gross lesions of neurolymphomatosis, while most of the remaining birds in each group showed abnormalities suggestive of some degree of fowl paralysis. It is concluded that wheat germ oil does not bring about quick recovery from true neurolymphomatosis gallinarum.

Effect of precooling and rate of freezing on the quality of dressed poultry, L. SAIR and W. H. COOK (*Canad. Jour. Res., 16 (1938), No. 6, Sect. D, pp. 139–152, figs. 3*).—Studies at the National Research Laboratories, Ottawa, indicated that the rate at which poultry was frozen had little or no effect on the number of bacteria present, the extent of surface desiccation, or the development of visceral taint. Visceral taint apparently developed largely during the thawing process and was entirely a question of the period during which the product was held above freezing temperature. A detailed study of the amount of "drip" after freezing showed that regardless of the rate of freezing the whole bird did not drip, but that freezing did change the condition of water in the muscle since drip was obtained from minced meat after freezing. In meat frozen within 3 hr. after slaughter drip was independent of the rate of freezing, but in meat held 24 hr. or longer at 0° C. before freezing the drip decreased as the rate of freezing increased.

Weight and hatchability of turkey eggs, T. C. BYERLY and S. J. MARSDEN. (U. S. D. A.). (*Poultry Sci., 17 (1938), No. 4, pp. 298–300, fig. 1*).—A study of the egg weight and hatchability of eggs from small-type turkey females of different varieties and crosses indicated an average egg weight of 77.4 g and an average hatchability of 79.1 percent of fertile eggs set. Eggs ranging from 73 to 87 g in weight gave higher hatchability than those weighing more or less. Eggs from females whose eggs averaged from 73 to 84 g gave a higher hatch than eggs from females whose eggs averaged more than 84 or less than 73 g. Of eggs from a single female, those weighing less than the average gave lower hatchability than those exceeding the average in weight.

Occurrence of slip tendon in quail in close confinement, C. C. BASS (*Game Breeder & Sportsman, 42 (1938), No. 8, p. 128*).—The occurrence of perosis in both the bobwhite quail and Oregon mountain quail held in close confinement is noted. The addition of a small amount of manganese or 15 percent of rice polish, or both, to a perosis-producing basal ration prevented the occurrence of this disorder.

Chastek paralysis, R. G. GREEN. (Univ. Minn.). (*Amer. Fur Breeder, 11 (1938), No. 1, pp. 4, 6, 8*).—A type of paralysis which has frequently been observed among foxes in recent years is described. This disorder is apparently due to a deficiency of vitamin B_1 in the diet and has generally occurred when the diet contained a rather high percentage of fresh fish. A common type of ration containing about 7 percent of fresh fish and 7 percent of liver was fed with good results, while a similar type of ration containing 18 percent of fresh fish and 2 percent of liver resulted in a severe outbreak of the paralysis. This disorder has not been observed when cooked fish were fed.

DAIRY FARMING—DAIRYING

Selecting dairy cattle, W. B. NEVENS and A. F. KUHLMAN (*Illinois Sta. Circ. 486 (1938), pp. 61, figs. 25*).—An extensive and well illustrated handbook on the selection of dairy cattle by production records and pedigrees and on the basis of dairy type.

Pedigree promise and progeny test among sires proved in Iowa Cow Testing Associations, J. L. LUSH and E. N. SHULTZ. (Iowa Expt. Sta.) (*Jour. Dairy Sci., 21 (1938), No. 8, pp. 421–432*).—A comparison of the progeny performance of bulls with Advanced Registry tested ancestry and those without such testing revealed that the bulls in the former group were used in higher producing herds and had higher testing daughters, but that the average increase in production of daughters over their dams was no greater than for the latter class. The correlation between the bull's progeny performance and the Advanced Registry records of the various ancestors was generally positive but so small as to be statistically insignificant, suggesting that the increased production in daughters from bulls having high-producing ancestry was only a small fraction of that superiority which the tested ancestors showed over the breed average.

Nutrients for lactation, working maintenance, and gain in live weight in American dairy cows, W. L. GAINES. (Ill. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 9, pp. 585–592, figs. 2*).—A further analysis of data previously described (E. S. R., 78, p. 241) led to the formulation of the following equation for expressing the nutrient requirement of milking cows of the Holstein, Guernsey, and Jersey breeds: $DN=0.275FCM+0.009W$, in which DN is the pounds of digestible nutrients per day, FCM the milk-energy yield in terms of pounds of 4-percent milk per day, and W the live weight in pounds.

Intervals in the electrocardiograms of calves fed cod liver oil, L. L. BARNES, G. K. DAVIS, and C. M. MCCAY. (Cornell Univ.). (*Cornell Vet., 28 (1938), No. 1, pp. 16–22*).—Electrocardiograms obtained for the experimental subjects used in determining the cod-liver oil tolerance of calves (E. S. R., 79, p. 383) showed a gradual increase in the time intervals in the electrocardiograms of both normal and experimental animals with increase in age, but there was no evidence to indicate cod-liver oil feeding damaged the conducting mechanism of the heart of the calf.

Blood fat of dairy cattle.—I, A simple volumetric method for determining blood fat. II, Factors influencing the fat content of the blood plasma, N. N. ALLEN (*Minnesota Sta. Tech. Bul., 130 (1938), pp. 52, figs. 16*).—In the method described in part 1, the blood plasma is digested with an alkaline reagent and the fat is then separated by centrifuging and measured volumetrically in the calibrated neck of a specially designed test bottle. By this method, neutral fats, sterols, sterol esters, and lipochromes are measured, but phospholipids are not included.

In part 2, the results of monthly individual blood fat determinations for over 100 head of cattle (four breeds) over a period of 2 yr. are reported. Plasma fat in the newborn calf was extremely low but increased rapidly after the first feeding. It varied with feeding conditions during the first year of life but was relatively constant during the second year. The plasma fat of nonpregnant heifers showed some seasonal variation, being lowest in early summer and highest in October. In pregnant heifers it was fairly constant but tended to decline during the last months of gestation. It was low immediately following parturition, rose to a maximum at about the fourth month of lactation, and then gradually declined to a low level during the dry period. Blood fat could be increased during lactation by feeding rations high in fat. Normal mature males showed lower blood fat values than lactating females. Cows showed marked individuality in the fat content of their blood plasma, but no systematic relationship could be established between blood fat values and productive ability or fat content of milk. A bibliography of 95 references to the literature is included.

Blood glucose and lactic acid in relation to milk secretion, J. C. Shaw, W. L. Boyd, and W. E. Petersen. (Minn. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 4, pp. 579–585, figs. 2*).—Following the recent demonstration of in vitro synthesis of lactose from glucose and lactic acid (E. S. R., 78, p. 527), the authors have compared the glucose and lactic acid content of simultaneously drawn arterial and mammary venous blood samples collected from dry and from lactating cows at various intervals after milking. Both glucose and lactic acid were absorbed by the lactating mammary gland in considerable quantities, the combined amounts being sufficient to account for all the milk lactose, but the glucose arterio-venous loss alone was not equivalent to the milk lactose produced. No definite relationship could be established between arterio-venous blood sugar differences and the period of time after milking or level of milk production.

Arginase in the mammary gland, J. C. Shaw and W. E. Petersen. (Univ. Minn.). (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 5, pp. 631, 632*).—Analyses of samples of mammary gland tissue from seven lactating and three nonlactating cows revealed that the active glands contained appreciable quantities of arginase, while the inactive glands contained much less or none at all. The amount of arginase present was proportional to the amount of preformed urea in the mammary gland extract, suggesting that urea is probably formed in the gland by arginase and the precursor of urea in the gland.

Amino acids and other non-protein nitrogen blood substances in relation to milk secretion, J. C. Shaw and W. E. Petersen. (Minn. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 5, pp. 632–635*).—Comparative analyses of simultaneously drawn venous and arterial blood samples gave evidence that the amino acids absorbed from the blood by the mammary gland of lactating cows could not account for more than about 35 percent of the milk proteins. Blood losses of uric acid, creatine, and creatinine on passage through the mammary gland were so slight as to indicate that they are not important in the nitrogen metabolism of the lactating gland.

What makes the goat's udder? C. W. Turner. (Mo. Expt. Sta.). (*Dairy Goat Jour., 16 (1938), No. 4, pp. 1, 5, 6, figs. 4*).—A popular discussion of the hormones involved in mammary gland development and milk secretion of the goat.

The effect of gelatin on the curd tension of milk, R. E. L. Berggren (*Jour. Dairy Sci., 21 (1938), No. 8, pp. 463–474, figs. 7*).—The influence of casein content and the pH of milk and the effects of adding gelatin on the curd tension have been studied. Increase in casein content was accompanied by an increase in curd tension with an abrupt rise in the S-shaped curve in the region of 2.9 percent casein. The average curd tension reached a maximum when the pH of the milk was between 5.7 and 5.9 before coagulation. The addition of gelatin very effectively reduced the curd tension of milk, additions of 2 percent gelatin causing reductions of 14–38 percent, 4 percent gelatin of 34–53 percent, and 6 percent gelatin 44–60 percent. Pork skin and bone gelatins varied somewhat in their effect with relation to their jelly strength. A bone gelatin of high viscosity and low jelly strength was most effective in reducing the curd tension of milk.

The activity for good and for ill of the enzymes in milk, K. G. Weckel. (Univ. Wis.). (*Milk Plant Mo., 27 (1938), No. 6, pp. 32–34, 36*).—An enumeration of the principal enzymes in milk and a brief description of their various functions.

The hemolytic streptococci of milk, C. F. Niven. (Cornell Univ.). (*Milk Dealer, 27 (1938), No. 11, pp. 64, 66, 67*).—Of 68 samples of raw and 245 samples of pasteurized commercial milk examined, 18 and 8.5 percent, respectively, contained hemolytic streptococci, exclusive of the narrow-zone hemolytic type which is the most typical form of *Streptococcus mastitidis*. Six groups or species were recognized, with *S. mastitidis* and the animal pyogenes the most prevalent in the raw and *S. durans* and *S. zymogenes* in the pasteurized milk.

Leucocytes and the methylene blue reduction test, N. J. Strynadka and H. R. Thornton (*Jour. Dairy Sci., 21 (1938), No. 9, pp. 561–568*).—Tests conducted at the University of Alberta, Canada, gave evidence that abnormal udder conditions responsible for milk of high leucocyte content were also responsible for abnormally high concentrations of reducing substances in milk, and that leucocytes are rarely if ever the main or significant influence in the reduction of methylene blue in milk in common practice.

A direct microscopic method for counting viable bacteria in milk, G. Knaysi and M. Ford. (Cornell Univ.). (*Milk Plant Mo., 27 (1938), No. 5, pp. 30–33*).—This is a report of research which has been previously noted (E. S. R., 79, pp. 242, 297.)

Note on violet red bile agar for detection of Escherichia coli, N. J. Miller and P. S. Prickett (*Jour. Dairy Sci., 21 (1938), No. 9, pp. 559, 560*).—This note describes an instance in which the direct plating of milk on violet red bile agar for the detection of *E. coli* was employed with excellent success.

Thermal shock resistance of milk bottles, C. T. Roland and H. A. Trebler (*Jour. Dairy Sci., 21 (1938), No. 9, pp. 575–583, fig. 1*).—This report describes a suitable thermal shock test for milk bottles. With one lot of bottles tested the percentage of bottles cracked ranged from 1, with a thermal differential of 80° F., to 47 percent at a 105°-differential, while in the second lot cracking ranged from 2.1 percent at a 60°-differential to 53 percent at a 90°-differential. Repeated thermal shocking of bottles under laboratory tests or repeated washing of bottles in a commercial washer both resulted in continual cracking with successive shocks. Washing during which the washer was stopped resulted in a higher percentage of cracking than when the machine was in continuous operation.

[Papers and proceedings of the twenty-sixth annual meeting of the International Association of Milk Sanitarians] (*Jour. Milk Technol., 1 (1938), No. 2, pp. 4–9, 14–35, 41–45, figs. 8*).—The following papers were among those presented before the annual meeting held at Louisville, Ky., October 11–13, 1937:

Sanitary Aspects of Paper Milk Containers, by M. J. Prucha (pp. 4–9) (Univ. Ill.); Suggestions for Sanitation of Ice Cream and Ice Cream Plants, by J. H. Frandsen (pp. 14–17) (Mass. State Col.); The Phosphatase Test, by A. B. Storrs and L. H. Burgwald (pp. 18–35) (Ohio State Univ.); and Proposed Standards for Paper Milk Containers, by J. R. Sanborn (pp. 41–45) (N. Y. State Expt. Sta.).

A possible new tool for the industry—sterilization by radiation, O. F. Garrett and R. B. Arnold. (N. J. Expt. Stas.). (*Milk Plant Mo., 27 (1938), No. 8, pp. 39, 40, 42*).—This report of preliminary investigations presents evidence that ultraviolet irradiation (Sterilamp) may be satisfactorily employed for the sterilization of dairy plant equipment, utensils, packages, wrappers, etc., and the floors, walls, and even the air in the storage rooms, processing plants, barns, etc., and for the treatment of cheese in curing rooms.

A study of the relation of the feed consumed by the cow to the composition of milk fat and the properties of butter, O. J. Hill and L. S. Palmer. (Minn. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 9, pp. 529–544*).—At the end of 6- or 7-day experimental feeding periods with the different rations under test, butter and butter oil samples were prepared from the milk of the experimental animals. Saponification values, iodine absorption value, Reichert-Meissl number, and melting points were made on butterfat samples and the hardness of the butter and butterfat was determined.

When barley constituted from 35 to 50 percent of a low-fat diet containing alfalfa or timothy hay hard butterfat with a low iodine value was produced. When from 35 to 50 percent of corn or oats was substituted in such rations the butter produced was satisfactory from a market standpoint, and the chemical characteristics of the fat tended to be rather specific for the type of ration fed. Alfalfa hay, timothy hay, or beet pulp fed with the low-fat grain ration exerted similar effects on the composition and physical properties of the butterfat. The inclusion of oils or fats in the ration resulted in butterfat assuming some of the chemical characteristics of the oil fed. However, the oils and fats did not influence the hardness of the butterfat to the same degree that they affected the iodine value. Linseed oil in the ration significantly increased the content of fatty acids less saturated than oleic acid as judged by the increase in difference between the iodine and thiocyanogen values.

The relation of color and carotene content of roughage in the dairy ration to the color, carotene content, and vitamin A activity of butterfat, R. E. Hodgson, J. C. Knott, H. K. Murer, and R. R. Graves. (U. S. D. A. and Wash. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 7, pp. 513–528, figs. 2*).—Over the 3-yr. period covered by these trials, groups of Holstein cows were fed home-grown field-cured hay, hay and grass silage, and grass silage, respectively, as sole rations during the winter period, while all groups received only pasture during the summer.

The hays contained an average of 14.8 μg of carotene per gram of dry matter, the hay-silage mixture 57, grass silage 197.3, and pasture 260 μg per gram of dry matter. The hay ration apparently supplied sufficient vitamin A for normal body activities and reproduction of the cows. The butterfat produced on these respective rations contained 3.6, 6.5, 6.8, and 7.9 μg of carotene per gram and 50, 86, 97, and 105 U. S. P. units of vitamin A per gram. The average percentage of carotene intake recovered in the butterfat was 0.71, 0.22, and 0.12 for the cows on hay, hay-silage, and silage, respectively. The carotene in butterfat accounted for only 11.2 to 13.7 percent of the total vitamin A activity in the various samples. The coefficient of correlation between the color and carotene content of butterfat was 0.866±0.034.

The effect of the composition of butterfat on its susceptibility of oxidation, V. C. STEBNITZ and H. H. SOMMER. (Wis. Expt. Sta.). (*Oil & Soap, 14 (1937), No. 9, pp. 228–232, figs. 4*).—A study of butterfat samples obtained from individual cows showed that there was considerable variation in the stability of samples from different individuals and from the same individual at different periods. The stability of the fat toward oxidation bore an inverse relation to the degree of unsaturation of the fat, with linoleic acid content rather than oleic acid the principal governing factor. Neither age of cow nor stage of lactation was significantly related to the stability of the fat. When cows received grass as a part of their ration the fat became less saturated and more susceptible to oxidation. It appeared that when the cows were on grass protective substances in the milk increased in amounts which tended to prevent the development of oxidized flavor in the milk. It was impossible to measure the stability of fat with the same degree of accuracy as the iodine and thiocyanogen numbers.

The titratable acidity and pH of butter, W. J. WILEY (*New Zeal. Jour. Sci. and Technol., 19 (1938), No. 7, pp. 451–453, fig. 1*).—Determination of the pH and titratable acidities of 70 Australian and 40 New Zealand butters (including salted and unsalted samples), made from different grades of cream showed quite close agreement between the two sets of values, practically all of the samples varying less than 0.3 unit of pH from the curve drawn through the mean values for pH and titratable acidity.

The correlation between organisms found microscopically in butter serum and the grade of cream from which the butter was made, T. I. HEDRICK. (Mont. State Col.). (*Jour. Dairy Sci., 21 (1938), No. 9, pp. 553–558*).—Four grades of cream were employed in these studies. A total of 524 samples of butter (143, 125, 159, and 97 prepared from excellent good, fair, and poor creams, respectively) were examined microscopically after 1–3, 7, 14, or 30 days' storage, and the grade of cream was predicted on the basis of the types and numbers of organisms appearing on the stained slide. The correct grade was assigned to 91.6, 58.4, 42.7, and 53.6 percent of the samples from excellent, good, fair, and poor creams, respectively, indicating that microscopic examination was fairly accurate in distinguishing butter made from high quality cream. The less reliable predictions for the lower grades were attributed, first, to the fact that low scoring cream may be due to causes other than bacterial count and, second, that contamination of cream may occur subsequent to pasteurization. The length of the storage period did not materially affect the accuracy of prediction nor did the presence or absence of culture organisms affect the microscopic grading.

Some causes for the deterioration in 10 days at 15.5° C. of salted butter made from sour cream, J. C. FLAKE and E. H. PARFITT. (Ind. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 9, pp. 545–551*).—A total of 504 samples of salted butter churned from sour cream between September and May were scored while fresh and after 10 days' storage at 15.5°. Twenty-five percent of those samples dropped at least 1.5 points in score and 11 percent decreased 2.5 points or more during such storage. Samples scoring 90 or more declined considerably more and those scoring under 89 slightly more in score than those scoring from 89 to 89.5. The month in which a sample was churned did not significantly influence its rate of deterioration. Large numbers of rod-shaped organisms were generally associated with poor keeping quality, but no relationship was found between the number or arrangement of cocci and keeping quality. A marked relation was found between a high proteolytic count on tryptone skim milk agar and between a high lipolytic count on tributyrin medium and low keeping quality.

Bacteriology of cheese.—III, Some factors affecting the ripening of blue (Roquefort type) cheese, C. B. LANE and B. W. HAMMER (*Iowa Sta. Res. Bul. 237 (1938), pp. 193–239*).—Continuing this series of investigations (E. S. R., 74, p. 843), the ripening properties of blue cheese manufactured by several methods were studied. Cheese made from homogenized milk was comparatively light in color, soft bodied, and ripened in a relatively short time, while cheese from unhomogenized milk required extended ripening periods and tended to be hard and yellow in color. Homogenization at 95° F. and dual pressures of 3,000 plus 500 lb. proved most generally satisfactory. Cheese from pasteurized homogenized milk showed more rapid development of volatile acids, higher fat acids, and more typical flavor but ripened more slowly than that from raw homogenized milk. A small amount of mold powder (0.01 percent of the curd weight) was adequate, and mixing the mold with the curd before hooping was the most satisfactory procedure. Delayed hooping was not a desirable procedure. Unskewered cheese ripened slowly and had a hard coarse body after ripening. Delaying salting for from 2 to 8 days after skewering was undesirable, particularly as it affected the cheese color. The presence of milk lipase, largely present in the milk serum, definitely aided in the cheese ripening. Small units of cheese (2 lb.) required longer ripening periods than normal-sized units, due to the more rapid drying out of the former. A bibliography of 54 references to the literature is cited.

The taxonomy of fungi of blue-veined cheese, S. DATTILO-RUBBO (*Brit. Mycol. Soc. Trans., 22 (1938), pt. 1–2, pp. 174–181, pl. 1*).—A total of 20 cheeses representing eight types of blue-veined cheese were examined for dominant mold types. *Penicillium roqueforti* Thom was found to be the dominent type in all but one of the cheese types, while the dominant mold in Dolce Verde cheese was found to be closely related to *P. expansum*. A new variety of mold was isolated from Blue Cheshire cheese for which the name *P. roqueforti* Thom *viride* is suggested. The *P. roqueforti* group may be subdivided on the colony characters into three classes.

Influence of manufacturing methods on acidity of brick cheese, D. W. SPICER and W. V. PRICE. (Univ. Wis.). (*Natl. Butter and Cheese Jour., 29 (1938), No. 10, pp. 18, 20, 21*).—Data are briefly reported on the influence of the amount of starter added, the length of the milk ripening period, the temperature of heating, and the time between rennetting and dipping on the acidity and quality of brick cheese. A moderate amount of starter (0.75 percent), a short ripening period, and relatively high heating temperature and long dipping time combined to produce a high percentage of sweet cheese of desirable quality. Slight variations in the moisture content-acidity relationships at various stages of the manufacturing process influenced the final quality of the product, emphasizing the need for careful control of these factors at every step in the manufacturing process.

Observations on the splitting of brick cheese, F. E. HANSON, D. W. SPICER, and W. V. PRICE. (Univ. Wis.). (*Jour. Dairy Sci., 21 (1938), No. 8, pp. 433–444, figs. 3*).—In an effort to determine the principal causes of excessive gas formation which result in the splitting of brick cheese, several conditions of manufacturing were studied, including variations in the ripening of cheese milk, types of starters, temperature of heating, type of dipping, moisture content of the cheese, method of salting, total amount of salt, and the effect of pasteurization. It appeared that a combination of conditions favorable to excessive gas formation rather than any single factor was responsible. Lack of acid development, low salt content, and large-sized loaves, all tended to encourage the development of late gas during the ripening period.

The theory and practice of ice cream making, H. H. Sommer (*Madison, Wis.: Author, 1938, 3. ed., pp. [6]+IX+639, pls. 4, figs. 61*).—The third edition of this popular text is noted (E. S. R., 73, p. 676).

A study of the qualities of commercial ice cream, W. H. Brown. (Purdue Univ.). (*Ice Cream Rev., 21 (1938), No. 9, pp. 110–114*).—A total of 570 samples of vanilla, chocolate, and strawberry ice creams, submitted by manufacturing companies, were analyzed with reference to bacterial content, chemical composition, and physical properties. These data are summarized. Of these, 79.8 percent of the samples were within the legal bacteriological standard of 100,000 per cubic centimeter and 65.9 percent contained less than 50,000 per cubic centimeter. Approximately 50 percent of the samples were positive for the presence of coliform organisms with approximately one-third showing relatively high coliform counts. Over 50 percent of the samples of each flavor contained from 10 to 12 percent butterfat, with from 12 to 14 percent being the next most popular class for chocolate and vanilla samples, while over one-third of the strawberry samples contained less than 10 percent fat. Flavor score, efficiency of homogenization, and melting resistance showed great variability.

The viscosity of ice cream mix made with plain and superheated condensed skim milk, R. Whitaker and L. D. Hilker (*Jour. Dairy Sci., 21 (1938), No. 9, pp. 569–573*).—A comparison of the viscosity of ice cream mixes (each containing about 28.5 percent of total solids) prepared with plain condensed skim milk, superheated condensed skim milk, and homogenized superheated condensed skim milk indicated that those mixes prepared with the superheated product were only slightly more viscous than those made with the plain condensed product. Homogenization of the superheated condensed skim milk reduced its apparent viscosity to such an extent that it could be easily poured and handled but in no way influenced the final viscosity of the ice cream mix prepared with it. Apparently any beneficial effects obtained by using superheated condensed skim milk are not the result of high viscosity but are probably directly attributable to the high heat treatment used.

Frozen pack fruits for ice cream, M. A. Joslyn and W. C. Cole. (Univ Calif.). (*Ice Cream Trade Jour., 34 (1938), No. 3, pp. 16, 18, 21, 55; also in Canad. Dairy and Ice Cream Jour., 17 (1938), No. 7, pp. 49, 51, 53*).—The literature on this subject is briefly reviewed. Frozen-pack fruits are found generally as satisfactory as fresh fruits providing they are of low tannin content and not too high in acid and do not contain active oxidizing enzymes. Recommendations are offered as to desirable butterfat content of the ice cream mix, size of fruit particles, and total amount of fruit to be included.

VETERINARY MEDICINE

[Work in animal pathology by the Utah Station] (*Utah Sta. Bul. 282 (1938), pp. 44–48, figs. 3*).—Brief reference is made to work on diseases of livestock by the Utah Station from its beginning.

Influence of bile and bile salts on Aërobacter aërogenes, J. E. Fuller. (Mass. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 4, pp. 507–510*).—Report is made of an investigation of the influence of prolonged propagation of *Aerobacter aerogenes* in media containing bile and bile salts on the biochemical reactions of the organism. The work with 30 strains isolated from water, carefully purified, and carried for 3 yr. on nutrient agar slants suggests a stability of the culture reactions of pure established cultures of *A. aerogenes*, so far as the influence of bile or bile salts alone is concerned.

Aujeszky's disease—common synonyms: "Pseudo-rabies," "infectious bulbar paralysis," "mad itch," I. A. Galloway (*Vet. Rec., 50 (1938), No. 25, pp. 745–762*).—This review includes a list of 98 references to the literature.

In vitro and in vivo effect of sulfanilamide on Brucella abortus and Brucella suis, B. D. Chinn (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 5, pp. 732–734*).—In vitro experiments reported have demonstrated the bactericidal and bacteriostatic effect of *p*-aminobenzenesulfonamide on *B. abortus* and *B. suis*. Similar results are said to have been obtained more recently with *B. melitensis*. It was found that "the oral treatment of *Brucella* infections in guinea pigs with *p*-aminobenzenesulfonamide is effective in preventing a generalized infection when treatment is begun immediately after infection. It appears from these experiments that most or all of the organisms are destroyed before any extensive invasion can take place or that the sulfanilamide inhibits the multiplication of the organisms in the tissues."

Infection with Brucella abortus treated with Prontosil, L. A. Richardson (*Lancet [London], 1938, I, No. 9, pp. 495, 496, figs. 2*).—Two cases are reported which indicate that abortus fever and its relapses can be controlled with sulfanilamide compounds.

The histopathology of mastitis.—A preliminary report, W. J. Gibbons. (Cornell Univ.). (*Cornell Vet., 28 (1938), No. 3, pp. 240–249, figs. 9*).—A brief report on the histology of the mammary glands, followed by an account of the microscopic pathology of mastitis.

The rôle of agglutinins in the Hotis test, E. C. McCulloch. (Wash. State Col.). (*Jour. Bact., 36 (1938), No. 3, pp. 311, 312*).—The author's finding is said to indicate that "Hotis-positive reactions will be produced by any organism which (1) multiplies in the udder and is present in the milk drawn, (2) stimulates the production of agglutinins, (3) tolerates 0.025 percent of bromocresol purple, (4) forms clumps when grown in the presence of its agglutinins, and (5) produces sufficient acid from lactose to increase the hydrogen-ion concentration of the clump to circa pH 5.4. Hotis-positive organisms were obtained from the nostrils of Hotis-negative cows and from the throats of 76 of 84 students. The streptococci from different positive reactions or from different clumps in the same tube often differed serologically and physiologically. The technic provides a convenient method for isolating streptococci from contaminated sources, since mixed cultures of streptococci tend to segregate into homologous serological groups during agglutination by serums containing agglutinins for several groups."

Leucocytozoon anatis Wickware, a synonym for L. simondi Mathis and Leger, C. M. Herman (*Jour. Parasitol., 24 (1938), No. 5, pp. 472, 473*).—Evidence is presented indicating that *L. simondi* Mathis and Leger 1910 and *L. anatis* Wickware 1915 are morphologically the same. Thus the name *L. simondi* holds by priority and *L. anatis* should be reduced to synonymy.

The nature of leukemia: A new fundamental principle leading to the development of specific disease, M. W. Emmel. (Fla. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 5, pp. 316–319*).—A new fundamental principle of self-perpetuating tissue autolysis is described as the basic process involved in experimental leukemia in the chicken, dog, monkey, hog, goat, and sheep. Tissue autolysis leading to leukemia was initiated by the intravenous injection of living and heat-killed species of paratyphoid and typhoid groups in all of these species, freshly emulsified, desiccated and autolyzed homologous tissues in the chicken, dog, monkey, and goat, and chemicals (benzene, phenol, and xylol) and suboxidation in the chicken. The fundamental nature of the process was similar in all instances. The analogies of leukemia and carcinoma are enumerated, and the hypothesis is advanced that the principle of tissue autolysis which concerns blood cells in leukemia is involved in carcinoma, in which the process is confined to cells of fixed tissue.

A study of the mechanism of the production of toxic substances by the Salmonella group of bacteria, F. L. Kraft and C. N. Stark. (Cornell Univ.). (*Jour. Infect. Diseases, 61 (1937), No. 3, pp. 315–319*).—*Salmonella* cultures grown in broth are shown "to produce something in the nature of a heat-stable endoenzyme which when released by natural autolytic processes or by a brief subjection to 100° C. is capable of acting on the broth constituents to produce certain changes characterized by a gradual increase in pH paralleled by an increase in toxicity. The findings here reported indicate that at least a part of the poisonous substances often called 'endotoxin' are split products of the culture medium resulting from the action on that medium of this heat-stable endoenzyme."

Inhibition of streptococcal hemolysin by sulfonamide compounds, P. Gross, F. B. Cooper, and M. Lewis (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 2, pp. 275–279*).—The authors have found sulfanilamide to cause a slight, almost negligible, inhibition of the hemolytic activity of streptococcal and staphylococcal hemotoxin. More marked inhibition of streptococcal hemolysin is produced by Prontosil II, normal rabbit serum, rabbit serum heated to 61° C., eosin, phenol, mercuric chloride, and sodium carbonate. The administration of sulfanilamide in vivo or its addition to serum in vitro does not enhance the inhibitory effect of rabbit serum upon streptococcal hemolysin. Prontosil I was found to have no inhibitory effect upon streptococcal hemolysin.

A preliminary report on the influence of hydrogen-ion concentration upon the longevity of Strongylus vulgaris (Looss 1900) in vitro, J. H. Whitlock and E. E. Leasure. (Kans. Expt. Sta.). (*Jour. Parasitol., 24 (1938), No. 5, p. 469, fig. 1*).—*S. vulgaris* individuals kept for a time under acid conditions did not live as long as others kept in the neutral solution.

Persistence of sylvatic plague, K. F. Meyer and B. Eddie. (Univ. Calif. et al.). (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 3, pp. 333, 334*).—Observations indicate that sylvatic plague probably persists indefinitely in an area once invaded and that the gross anatomical examinations fail to detect rodent infections. Ground squirrels (*Citellus beecheyi*), just as rats, may harbor the plague organism (*Pasteurella pestis*) without visible lesions.

The staining of Trichomonas foetus Riedmüller with Wright's blood stain, H. M. Stewart (*Jour. Parasitol., 24 (1938), No. 5, pp. 473, 474*).—A satisfactory procedure for staining *T. foetus* is described, in which Wright's blood stain is used.

The effect of Trichomonas foetus on tissue culture cells, M. J. Hogue (*Amer. Jour. Hyg., 28 (1938), No. 2, pp. 288–298, pls. 3*).—In studies conducted in which 3 pure cultures (without bacteria) of *T. foetus* were used, all gave practically the same results. "The tissue cultures of embryonic chick tissues and the *T. foetus* lived together in the same culture medium, which consisted of 1 part of chicken serum to 10 parts of Schumaker's modified Ringer's solution. *T. foetus* gave off a substance which killed the tissue culture cells. Filtrates from a 17-day-old culture of *T. foetus* killed the tissue culture cells as quickly as did the living *T. foetus*. Filtrates stored at 12° C. deteriorated very little in 178 days. Cultures of *T. foetus* heated for 15 min. at 55° were almost as toxic to the tissue culture cells as were the living trichomonas, showing that the toxic substance at this temperature is fairly thermostable. Cultures of *T.*

foetus heated at 60° to 62° for 20 min. did not affect the growth of the tissue culture cells. The substance given off by *T. foetus* was not enzyme, i. e., it did not digest starch or egg proteins. The tissue culture cells react to *T. foetus* (1) by becoming granular and dying fairly quickly, or (2) by forming vacuoles and dying more slowly, or (3) by contracting. The tissue culture cells survive in a solution of neutral red which kills the trichomonas."

A study of Trichinella spiralis in the Hawaiian Islands, J. E. Alicata (*Pub. Health Rpts.* [*U. S.*], *53* (*1938*), *No. 10, pp. 384–393, figs. 2*).—The survey here reported has shown that trichinae are present in the rat, mongoose, and wild and domestic hog on the island of Hawaii, and in the mongoose and rat on the island of Maui.

Studies in animal trypanosomiases.—IV, The effect of Trypanosoma congolense and Trypanosoma brucei on some inorganic blood constituents, M. H. French (*Jour. Compar. Path. and Ther., 51* (*1938*), *No. 2, pp. 119–127*).—A continuation of the contribution previously noted (E. S. R., 80, p. 103).

Susceptibility and resistance of various species of Peromyscus (American deer mice) to infection with Trypanosoma hippicum, and the possibility of certain "wild mice" being reservoir hosts to pathogenic trypanosomes, A. Packchanian (*Amer. Jour. Trop. Med., 18* (*1938*), *No. 5, pp. 587–593*).—Report is made of a study the results of which suggest the possibility of American deer mice (*Peromyscus* spp.) serving as hosts of *T. hippicum* in sporadic outbreaks of trypanosomiasis in horses and mules in Panamá.

Occurrence of tularaemia in the rabbit tick (Haemaphysalis leporis-palustris) in Alaska, C. B. Philip and R. R. Parker (*Pub. Health Rpts.* [*U. S.*], *53* (*1938*), *No. 15, pp. 574, 575*).—The recovery of *Bacterium tularense* from naturally infected rabbit ticks off varying hares (snowshoe rabbits) taken in the vicinity of Fairbanks, Alaska, is recorded. This is said to be the first evidence of tularemia in that area.

Sulphanilamide in the treatment of undulant fever, A. E. Francis (*Lancet* [*London*], *1938, I, No. 9, pp. 496, 497, figs. 2*).—The results obtained from the two cases reported appear to show that *Brucella abortus* is considerably more susceptible to the action of sulfanilamide in vitro than is *Streptococcus pyogenes* under the same conditions.

A histopathological study of the bovine udder, C. C. Morrill (*Cornell Vet., 28* (*1938*), *No. 3, pp. 196–210, figs. 8*).—Report is made of a histopathological study at the Michigan State College of the mammary glands of 20 cows and heifers, 15 of which were in some stage of lactation, 3 had never lactated, and 2 were in the dry state following lactation at the time of slaughter. "A larger number of quarters shows exudation of polymorphs than shows any other lesion; however, productive tissue changes in the stroma are almost as widespread. So-called subacute interstitial mastitis is seen much less frequently. In many areas, especially those showing exudation of polymorphs, the presence of a marked vacuolar degeneration of the alveolar epithelium is demonstrated. Based on microscopic appearance alone, alteration of secretions is most marked in areas showing recent acute injury. Chronic productive changes affect the quantity of secretions more markedly than the quality, by replacement of the secreting elements. Evidence is presented which upholds the belief that most udder infection is via the teat canals. Streptococcic mastitis is revealed as an insidious, but unmistakably progressive, disease disposed to occasional flare-ups of an acute nature."

Bovine mastitis: The relation of streptococci to physical changes occurring in the udders of dairy cows, W. T. Miller and H. W. Johnson. (U. S. D. A.). (*Amer. Jour. Pub. Health, 28* (*1938*), *No. 10, pp. 1222–1230*).—

In the course of the studies reported milk samples from 629 cows in 9 dairy herds were examined for the presence of streptococci by 3 bacteriological methods, namely, the Hotis test, microscopic examination of incubated milk, and culture of incubated milk on blood agar plates. Streptococci were detected in milk samples from 47.4 percent of these animals, all of which were present in only 5 herds. No streptococcus-infected cows were found in 4 herds with a total of 82 animals. The hightest incidence of infection occurred in the largest herds, and the lowest in the smallest of the 5 herds.

When the udders of 617 cows were examined by palpation for indurations as soon as possible after they were milked out, on the basis of physical condition 45 were placed in class 1, free of indurations; 149 in class 2, with slight indurative changes; 321, definitely indurated and placed in class 3; and 102 showing marked physical evidence of mastitis and belonging in class 4.

There were 291 cows infected with streptococci as compared with 326 in which these organisms could not be detected. Of the infected animals 7 of the udders were in class 1, while 38 of the uninfected cows fell in this group. In class 2 there were 53 infected cows and 96 uninfected cows. There was no significant difference in class 3 between the two groups, but in class 4 there were 72 infected cows against 30 uninfected.

A list is given of 21 references to the literature cited.

The distribution of the mastitis streptococci in dairy herds, J. Ferguson (*Cornell Vet., 28 (1938), No. 3, pp. 211–220, figs. 3*).—Report is made of the examination of quarter milk samples of all the cows in 18 herds for the presence of streptococci. Twenty-one percent of the total number of animals (655) were infected. "Of the 229 cultures isolated from as many quarters 70 percent were *Streptococcus agalactiae*, 7 *S. dysgalactiae*, 10.8 *S. uberis*, 5.6 streptococci of other types, and 6.5 percent were unidentified. The extent of infection varied widely within the individual herds and was greatest in those herds infected with *S. agalactiae*. In the herds having only a few infected animals, *S. agalactiae* was not present. The frequency of occurrence and the herd distribution of the four hemolytic types of *S. agalactiae* are given."

Bovine trichomoniasis, H. S. Cameron (*California Sta. Bul. 624 (1938), pp. 19, figs. 5*).—This is a practical account of a disease due to the flagellated protozoan parasite *Trichomonas foetus* Ried., based in part upon information previously published and in part upon recent investigations in the San Joachin Valley. First recorded in this country in 1932 from Pennsylvania (E. S. R., 68, p. 530), it has since appeared in numerous States, ranging from the eastern seaboard to the Pacific, and is apparently widespread in California. Accounts are given of its distribution and economic importance, the causal organism, the course of the disease, the symptoms and diagnosis, treatment, and control. Tabular records of transmission by two bulls and diagrammatic analyses of the breeding records (1) of a herd and (2) of a herd showing a good breeding history are included, together with a list of 15 references to the literature.

Enzootic pneumonia in sheep, R. F. Montgomerie, T. J. Bosworth, and R. E. Glover (*Jour. Compar. Path. and Ther., 51 (1938), No. 2, pp. 87–107*).—A description is given of an enzootic form of pneumonia in sheep, outbreaks of which have been investigated in North Wales and East Anglia. It bears a close resemblance to the condition occurring in Iceland as described by Dungal (E. S. R., 66, p. 74). An organism nearly related to the *Pasteurella* group was isolated from affected lungs showing an advanced stage of hepatization.

Species differentiation in the coccidia from the domestic sheep, J. F. Christensen. (U. S. D. A.). (*Jour. Parasitol., 24 (1938), No. 5, pp. 453–467,* *figs. 9*).—A survey made of fecal samples from 100 sheep for coccidial oocysts revealed 96-percent infection, 34 percent being pure infections with a single species and 62 percent mixed infections with 2 to 4 species each. "Size, shape, color, sporulation time, and morphology of the unsporulated oocyst were the criteria used for species identification. The oocysts of *Eimeria parva, E. ninakohl-yakimovi, E. faurei, E. arloingi,* and *E. intricata* are redescribed. Oocysts conforming to the description of those of *E. galouzoi* were found in the spherical range of *E. parva,* and oocysts similar to those described for *E. aemula* were observed among atypical and capless oocysts of *E. arloingi.* Two new species, *E. pallida* and *E. granulosa,* are described from oocysts found repeatedly in fecal samples."

Field application of hog cholera tissue vaccine, W. H. Boynton, G. M. Woods, and F. W. Wood. (Univ. Calif. et al.). (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 5, pp. 291–296*).—The diminution of losses from secondary complications resulting in the course of field trials of hog cholera with tissue vaccine is considered to indicate clearly the safety of the method in respect to postvaccination "breaks." A completely negative record of hog cholera cases subsequent to the use of tissue vaccine on various premises occupied by 30 herds, totaling 15,125 pigs, is considered as unmistakable evidence of the progress which can be and is being made in its control.

Human encephalitis caused by the virus of the eastern variety of equine encephalomyelitis, L. D. Fothergill, J. H. Dingle, S. Farber, and M. L. Connerley (*New England Jour. Med., 219 (1938), No. 12, p. 411*).—Record is made of the isolation of the virus of the eastern type of equine encephalomyelitis from a fatal case of encephalitis in a child in Massachusetts.

Recovery of eastern equine encephalomyelitis virus from brain tissue of human cases of encephalitis in Massachusetts, L. T. Webster and F. H. Wright (*Science, 88 (1938), No. 2283, pp. 305, 306*).—The authors confirm the discovery of Fothergill et al. (above noted) and report positive findings in four additional human cases of encephalitis that occurred in late August and early September 1938 during an unprecedented outbreak of equine encephalomyelitis in Massachusetts.

Equine encephalomyelitis produced by inoculation of human encephalitis virus, H. W. Schoening, L. T. Giltner, and M. S. Shahan. (U. S. D. A.). (*Science, 88 (1938), No. 2287, pp. 409, 410*).—Report is made of the experimental inoculation of horses and guinea pigs with the virus that caused the death of a child during the course of the epidemic of equine encephalomyelitis in Massachusetts. The symptoms in the inoculated animals, the comparatively brief incubation period, the acute course of the disease, the immunity against the injected virus in the eastern type encephalomyelitis-immune horse, and the equal susceptibility of the normal and the western type encephalomyelitis-immune horses are considered to furnish conclusive evidence that this virus, which was isolated from a human case reported by L. D. Fothergill et al. (above noted), is indistinguishable from the eastern type of the equine encephalomyelitis virus. It is stated that all five of the strains of equine encephalomyelitis virus that have been recovered by the U. S. D. A. Bureau of Animal Industry from Massachusetts horses during the 1938 epizootic have been definitely determined to be of the eastern type through exposure of guinea pigs immunized against the eastern and others immunized against the western type of the equine virus.

Recovery of the virus of equine encephalomyelitis from the brain of a child, B. Howitt. (Univ. Calif. et al.). (*Science, 88 (1938), No. 2289, pp. 455, 456*).—Report is made of the finding of the western type of the equine encephalomyelitis virus to have caused the death of a child in California.

Studies on eastern equine encephalomyelitis.—I, Histopathology of the nervous system in the guinea pig, L. S. King (*Jour. Expt. Med., 68 (1938), No. 5, pp. 677–692, pls. 4*).—The action of the virus of equine encephalomyelitis in the guinea pig brain was studied, and the various histopathological changes of the nervous system in the guinea pig are described in detail.

Intraperitoneal and intracerebral routes in serum protection tests with the virus of equine encephalomyelitis, II, III, P. K. Olitsky and C. G. Harford (*Jour. Expt. Med., 68 (1938), No. 5, pp. 761–777, 779–787*).—Two additional contributions are presented (E. S. R., 79, p. 539).

II. *Mechanism underlying the difference in protective power by the two routes.*—In the work here reported minute amounts of antiserum injected intraperitoneally were found to protect against large doses of equine encephalomyelitis virus given intramuscularly or intraperitoneally in 12- to 15-day-old mice, "Antiserum given intraperitoneally with virus intracerebrally or intranasally results in little or no protection. These phenomena occur as well when serum-virus mixtures are injected at the different sites. The marked variation of the protective capacity of antiserum as thus displayed would appear to be dependent upon the differing pathways of progression of the virus from the site of injection to the central nervous system."

III. *Comparison of antiviral serum constituents from guinea pigs immunized with active or formolized inactive virus.*—Control experiments having shown that the serums of animals immunized with active virus have much greater protective potency when serum-virus mixtures are injected intraperitoneally into 12- to 15-day-old mice than when given intracerebrally, similar tests were made on serums derived from guinea pigs immunized by vaccines in which the virus had been inactivated by formalin.

"In comparing the content of antiviral body by means of intracerebral and by intraperitoneal inoculation, it was found that both serums show about the same low degree of neutralizing capacity by the former method. By intraperitoneal inoculation, on the other hand, serum collected from guinea pigs immunized by means of active virus reveals high protective power, while that from animals receiving formolized, inactive virus exhibits lower neutralization titers which approach those obtained by the intracerebral method. The significance of this unexpected finding is discussed."

A list of references to the literature accompanies each contribution.

Production of antiserum for equine encephalomyelitis, E. Records and L. R. Vawter. (Univ. Nev.). (*Jour. Bact., 36 (1938), No. 3, p. 295*).—It is pointed out that antiserum of high virus-neutralizing titer will be needed for some time as an aid in the treatment of clinical cases of equine encephalomyelitis. Further, even after a prolonged course of immunization by the subcutaneous injection of the virus into horses the response is poor or variable and the serums of only a few animals attain a titer considered satisfactory for clinical use. The authors have recently observed that a single intravenous injection of a large dose of this virus into immune horses results in a tenfold rise of antiviral titer in 10 days. Thus far, no fatalities or unduly severe reactions have been encountered in the injected horses following this procedure. Titration of the virus-neutralizing power of individual and pooled serums from hyperimmune horses has been conducted on both 10-day chick embryos and guinea pigs. The chick embryo is considered equally, if not more, dependable than guinea pigs. The use of the embryos, moreover, is considered decidedly more economical and the procedure more rapid.

The antigenic stability of western equine encephalomyelitis virus, C. E. Beck and R. W. G. Wyckoff (*Science, 88 (1938), No. 2281, p. 264*).—Brief reference is made to studies of the homogeneity and stability of the western strain of the equine encephalomyelitis virus by testing the immunity of vaccinated animals to virus derived from as widely different sources as possible. The work gives evidence that this type of virus has not been greatly altered in its antigenic structure by transfer to guinea pigs, mice, and chicken embryos. "The fact that a vaccine gave complete protection against viruses from localities as widely separated as Iowa and Texas proves that this disease is substantially the same in different parts of the country in which it occurs. Since vaccine made with 1933 virus protects against 1937 viruses, we may be confident that vaccines made with previous years' viruses will be effective against the disease that is now epidemic in several midwestern States and Canada."

Immunological studies on equine encephalomyelitis, A. Eichhorn and R. W. G. Wyckoff (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 5, pp. 285–290*).—In the work reported the chick embryo proved a most suitable medium for the propagation of equine encephalomyelitis virus. "When fully diseased the virus concentration within it is 100,000 times that in horse brain. Formalinized chick-embryo vaccine is incomparably more effective for immunization than horse-brain vaccine. With chick vaccine it is possible to provide complete protection to horses against intracerebral inoculation of many fatal doses of virus. Chick vaccine possesses such a high degree of potency that it is feasible to standardize every batch for protective value prior to use. With the aid of the chick vaccine it is possible to inaugurate an effective control of equine encephalomyelitis."

A study of the blood in horses infected with infectious anemia, H. L. Hammersland, H. S. Herrin, and C. F. Haynes (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 5, pp. 320–324, figs. 2*).—In the studies reported the average sedimentation reading for the infectious anemia horses was 26 and for the normal horses 18. It is believed that the blood sedimentation test is useful in the diagnosis of the disease and has two values, one as a diagnostic lead and the other as a diagnostic gage. A slight leucocytosis was found to be present in the infected animals, together with a slight decrease in hemoglobin and the number of erythrocytes. A slight increase in calcium and a decrease in iron were found. A large number showed the presence of bile.

Studies on the normal variations in the strongyle egg counts of horse feces, J. W. Britton (*Cornell Vet., 28 (1938), No. 3, pp. 228–239, figs. 2*).—Intermonthly fluctuations in the egg counts of the feces of horses are shown which are correlated with environmental conditions. Intramonthly variations in the egg output of horse strongyles have also been demonstrated which are unrelated to atmospheric conditions and are possibly due to cessation of egg production by the females. The interval between peaks of the intramonthly variations was found to be from 11 to 13 weeks, and the interval between troughs was 13 weeks. The results of an artificial infection with strongyle larvae indicates a period of 5 mo. from the ingestion of larvae to the maximum egg production of the females. A list of 18 literature references is included.

Treatment of spontaneous canine distemper with sulfanilamide, P. M. Marcus and H. Necheles (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 3, pp. 385–387*).—Sulfanilamide and Prontosil have been used by the authors successfully in the treatment of distemper in dogs and appear to be equally effective.

Studies on the infection of dogs with trophozoites of Endamoeba histolytica by the oral route.—A preliminary report, J. C. Swartzwelder (*Pub. Health Rpts. [U. S.], 52 (1937), No. 42, pp. 1447–1451*).—Amebic infection was produced in 5 of 13 dogs following the ingestion of trophozoites of *E. histolytica*, obtained from donor dogs on a salmon diet, in a cyst-free medium. This is considered to be the first time that infection with trophozoites by mouth has been produced experimentally in dogs.

[Contributions on avian pathology] (*Poultry Sci., 17 (1938), No. 5, pp. 435, 436, 442, 443, 446, 447*).—Abstracts of contributions presented at the annual meeting of the Poultry Science Association held at Pullman, Wash., in August 1938 (E. S. R., 78, p. 541) include: Is Paralysis of Fowls, as Manifested by Iritis, Transmitted Through the Egg? by C. F. McClary and C. W. Upp (La. State Univ.); The Protective Effect of Sulphur Against Artificial Infection With *Eimeria acervulina* and *Eimeria tenella*, by E. M. Dickinson and R. H. Scofield, and Erysipelas of Turkeys, by H. A. Hoffman and W. R. Hinshaw (both Univ. Calif. et al.); Transmission of Leukemia in Young Chickens, by C. M. Hamilton and C. E. Sawyer (Wash. Expt. Sta.); Fowl Paralysis, Leukemia, and Allied Conditions in the Fowl, by M. W. Emmel (Fla.); An Experimental Attempt to Produce Lymphomatosis in Chickens by Injections With *Salmonella aertrycke* and Lymphomatous Nerve Tissue, With Observations on the Blood Pictures of the Chickens, by J. R. Beach and N. M. Twisselmann (Univ. Calif.); An Important Factor Influencing the Development of Fowl Paralysis, Leukemia, and Chronic Hemocytoblastosis in the Hen-Battery Plant, by M. W. Emmel (Fla.); and Fowl Leukosis, by C. D. Lee and H. L. Wilcke (Iowa State Col.).

Nutrition as a factor in the incidence of fowl leukosis, W. J. Butler, D. M. Warren, and H. L. Hammersland (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 5, pp. 307–315, figs. 6*).—Increased production and a decrease in the incidence of fowl leucosis have been found to follow changes in nutrition, which include the addition of medicinal amounts of cod-liver oil and cold-pressed wheat-germ oil. The blood picture of fowl leucosis is apparently constant. The history of one flock reported supports the theory that fowl leucosis is transmitted through the egg. The history of a second flock indicates that fowl leucosis may be transmitted through the egg or possibly carried by mechanical means from nonclinical (carrier) cases to susceptible birds, and that direct contact is not essential for the development of fowl leucosis. The history of a third flock indicates the advisability of attempting to control fowl leucosis by merely destroying the flock, cleaning up the premises, and making baby chick replacements. In certain flocks it is indicated to reduce protein intake and increase the grain ration. Where cod-liver oil and wheat-germ oil are used, the wheat-germ oil should be mixed with the cod-liver oil and added to the feed just previous to its use. In the majority of the flock cases 0.5 percent cod-liver oil and 0.2 percent cold-pressed wheat-germ oil were so added to the base feed.

Transmission of avian leucosis: A note on Beach's experiments, R. K. Cole. (Cornell Univ.). (*Poultry Sci., 17 (1938), No. 5, pp. 417, 418*).—An application of the usual methods of statistical analysis has led the author to conclude that in the experiments of Beach (E. S. R., 79, p. 251) the transmission of avian lymphomatosis by inoculation was accomplished.

Observations on the biology of the poultry cestode Davainea proglottina in the intestine of the host, P. P. Levine (*Jour. Parasitol., 24 (1938), No. 5, pp. 423–431*).—Observations of the biology of *D. proglottina* are reported, with the details given in tables.

Studies on the control of the poultry cestode Davainea proglottina (Dav.), P. P. Levine (*Cornell Vet., 28 (1938), No. 3, pp. 220–227*).—Report is made of the treatment of tapeworm (*D. proglottina*) infected chickens with some 20 anthelmintics, none of which was effective. Tobacco dust in the proportion of 2 percent of the mash by weight did not prevent infection with *D. proglottina*, neither did copper sulfate in the drinking water in the proportion of 1/500. Cysticercoid-bearing slugs (*Agriolimax agrestis*) survived the severe winter of 1935–36 under field conditions. They survived 8 days at 3° to 5° C. and proved to be infective to chickens. Subsequent exposure to —1° for 24 hr. was lethal for the slugs and the cysticercoids.

Observations on the life history of Raillietina echinobothrida and of R. tetragona (Cestoda), M. W. Horsfall. (U. S. D. A.). (*Jour. Parasitol., 24 (1938), No. 5, pp. 409–421, figs. 3*).—The two common poultry tapeworms of economic importance (*R. echinobothrida* and *R. tetragona*), which injure the host by destroying the tissue by burying their heads deep in the intestinal wall and even through the muscularis mucosae and by causing the formation of intestinal nodules, are dealt with. Both the pavement ant and *Pheidole vinelandica* have been shown by Jones and the author (E. S. R., 74, p. 695) to serve as intermediate hosts of these cestode species. In the course of laboratory tests individuals of the pavement ant were infected with *R. echinobothrida*. Under natural outdoor conditions the two cestodes were present throughout the year in chickens. The ants were active from March 15 through December, but were only found naturally infected from approximately June 1 through December in 1935 and 1936.

The land-snail an intermediate host of the cecae fluke of poultry, J. E. Alicata. (Univ. Hawaii). (*Science, 88 (1938), No. 2275, p. 129*).—Experiments conducted during the past year on the life history of *Postharmostomum gallinum* have shown the land snail (*Eulota similaris*) to be the common carrier of this fluke under natural conditions in Hawaii. Snails collected in fluke-endemic poultry farms near Honolulu were found heavily infected with larval flukes (adolescercariae), the largest of which measured 0.87 mm long and 0.39 mm wide and possessed well-developed suckers and ceca closely resembling those of the adult fluke.

An improved critical test for poultry taeniacides, P. D. Harwood and A. C. Jerstad. (U. S. D. A.). (*Poultry Sci., 17 (1938), No. 4, pp. 295–297*).—Tests made of a method for determining the maximum efficiency of a teniacide for removal of *Raillietina cesticillus* of chickens are reported. "A mixture of drugs containing kamala was given to six chicks, each of which had been artificially infected with a single tapeworm. At necropsy 1 week after treatment each of five of the experimentally infected chicks was infested with a single specimen of *R. cesticillus*. The fate of a single tapeworm in one chick is not satisfactorily explained by the data presented."

The common duck as a convenient experimental host for avian Plasmodium, F. Wolfson (*Amer. Jour. Hyg., 28 (1938), No. 2, pp. 317–320*).—Experiments in which a total of 10 ducks and 6 canaries were used have led to the conclusion that the duck may serve as a convenient host for experiments on bird malaria and that it possibly may enable the study of certain morphological and physiological changes of *Plasmodium* due to residence in a foreign host.

Some trematode parasites of ducks and geese in eastern Canada, D. G. Cannon (*Canad. Jour. Res., 16 (1938), No. 9, Sect. D, pp. 268–280, figs. 9*).—Further knowledge of the distribution of trematode parasites encountered in ducks and geese obtained through the collections made in eastern Canada during the general survey work is reported. Of the eight species found, *Stephanoprora mergi*, taken from the ceca of an American merganser duck, is described as new, and *Echinoparyphium elegans* (Looss 1899) and *Psilochasmus longicirratus* Skrj. 1913, both from the small intestine of the black duck, are recorded for the first time in America. Other specimens recorded are *Echinostoma revo-*

lutum (Frölich 1802), *Hypoderaeum conoideum* (Bloch 1782), *Zygocotyle lunata* (Dies. 1836), *Apatemon gracilis* (Rud. 1819), and *Notocotylus attenuatus* (Rud. 1809). Several species are described from new hosts.

Epidemiology of malaria in eastern red-wings (Agelaius p. phoeniceus), C. M. Herman (*Amer. Jour. Hyg., 28 (1938), No. 2, pp. 232–243*).—In the course of a study made of malaria in the eastern redwing at the Austin Ornithological Research Station on Cape Cod, Mass., during the summer of 1937, but 1 of 53 adult birds examined by blood smears was found infected. "When blood from 48 of these adults was subinoculated into clean canaries, 19 cases of *Plasmodium circumflexum* (40 percent) and 10 cases of *P. cathemerium* (20 percent) were disclosed, a total prevalence of 60 percent. Parasites were observed in blood smears from only 2 of 86 young examined. Blood from 38 of these young was subinoculated into clean canaries, of which 11 subsequently showed parasites, an incidence of about 28 percent. All *Plasmodium* infections observed in young redwings were *P. circumflexum*. . . . The evidence presented suggests that the young redwings did not obtain their infections while on the nest. A few obtained infections shortly after leaving the nest, but the greatest incidence was in birds about 1 mo. old. . . . The lack of infection with *P. cathemerium* in the young may be due to the fact that *P. cathemerium* produces a low grade of infection in redwings as compared with *P. circumflexum*."

An outbreak of botulism in captive mink on a fur farm in Colorado, I. C. Hall and G. W. Stiles. (U. S. D. A. et al.). (*Jour. Bact., 36 (1938), No. 3, p. 282*).—The death of 146 of 148 mink on a fur farm near Denver is shown to have been caused by the toxin of *Bacillus botulinus* type A. This appears to be the first recorded instance of naturally occurring botulism in mink or other fur-bearing animals.

A description of shock disease in the snowshoe hare, R. G. Green and C. L. Larson. (Univ. Minn., U. S. D. A., et al.). (*Amer. Jour. Hyg., 28 (1938), No. 2, pp. 190–212, pl. 1*).—This contribution relates to shock disease of the wild snowshoe rabbit that apparently accounts for the vast majority of deaths among hares during the period of population decline, earlier accounts of which by the authors have been noted (E. S. R., 80, p. 112). When brought under conditions of captivity during the sharp period of population decline, most hares succumb to this affliction within a few days. Shock disease has been found widespread in snowshoe hares in Minnesota during several years previous to and following 1936. The fact that deaths of hares from shock disease have been observed under natural conditions indicates that in captivity they are but an exaggeration of the occurrence and mortality of this disease in nature.

AGRICULTURAL ENGINEERING

[Engineering studies in North Dakota], H. F. McColly (*North Dakota Sta. Bimo. Bul., 1 (1938), No. 1, pp. 6, 7*).—Data are reported as to the construction and use of ice wells and a home-made 6-v electric fence controller.

Inventory of unpublished hydrologic data, W. T. Holland and C. S. Jarvis (*U. S. Geol. Survey, Water-Supply Paper 837 (1938), pp. II+77*).—This comprises three separate analyses as follows: (1) Notes on early records available only in files of U. S. Weather Bureau and Smithsonian Institution, (2) inventory of unpublished hydrologic data, and (3) bibliography of published but obscure records of hydrologic data.

Surface water supply of the United States, 1937.—Parts 10, 11 (*U. S. Geol. Survey, Water-Supply Paper 830 (1938), pp. IV+97, pl. 1; 831 (1938), pp. VII+358, pl. 1*).—These papers present the results of measurements of flow made on streams during the year ended September 30, 1937, the first in the Great Basin and the second in the Pacific slope basins in California.

Tests for the permeability of soils, C. W. Robinson (*Jour. Boston Soc. Civ. Engin., 25 (1938), No. 3, pp. 394–408, figs. 4*).—The author describes the construction and operation of a soil permeameter arranged for constant heading, for upward as well as for downward flow, and for the insertion of three piezometers opening at different levels into the soil column, together with two additional piezometers, one above and one below the soil column.

"The rate with which a soil will permit water to flow through it is of prime importance in the design of practically all structures in contact with earth. It is of especial importance in the design of earth dams, foundations on more or less plastic soils, retaining walls and cofferdams." It is pointed out that a study of disturbed samples, of which the natural structure has been lost, is justifiable in connection with such constructions, in that "the material in the dam will have little, if any, structural relation to the material in its natural state. The soil under the dam will be much compressed and altered and will differ considerably in structure from what it was previous to the placing of the dam. Therefore, disturbed samples are satisfactory for most purposes in preliminary work at least."

Public Roads, [October and November 1938] (*U. S. Dept. Agr., Public Roads, 19 (1938), Nos. 8, pp. [2]+153–172+[1], figs. 21; 9, pp. [2]+173–192+[1], figs. 17*).—No. 8 contains data on disposition of State motor fuel and State motor carrier tax receipts, State motor vehicle receipts, and receipts from State imposts on highway users, all for 1937; data on the current status of Federal-aid highway, secondary or feeder road, and grade-crossing projects, all as of September 30, 1938; and an article entitled The Effect of Using a Blend of Portland and Natural Cement on the Physical Properties of Mortar and Concrete, by W. F. Kellermann and D. G. Runner (pp. 153–166). No. 9 contains data on the status of Federal-aid highway, secondary or feeder road, and grade-crossing projects as of October 31, 1938, and the following articles: A Study of Sand-Clay Materials for Base Course Construction, by C. A. Carpenter and E. A. Willis (pp. 173–186, 189, 190); and Reflector Buttons Installed on Michigan Highway, by M. D. Van Wagoner (pp. 187–189).

Corn drying, F. E. Price and I. Branton (*Oregon Sta. Bul. 352 (1937), pp. 30, figs. 20*).—This publication discusses the general subject of the dehydration of corn and reports the results of experiments with the process with particular reference to its economic aspects. The height and the width of the corn column do not affect the efficiency of the drier, but the thickness of the column was found to be very important. A maximum width of 36 in. is recommended, as it would be difficult to support the hardware cloth sides of a wider column. An analysis of data from 36 tests with the continuous-process shelled-corn drier indicates that three variables materially affect the moisture differential across the column. These variables are (1) the thickness of the corn column, (2) the temperature of the air entering the drier, and (3) the air velocity through the corn column. The slower the air velocity through the column at any given drying temperature and column thickness the greater will be the moisture differential across the column. A comparison of two groups of tests made when using a 4-in. column of corn demonstrated the effect of air velocity. The average temperature of the series of tests was 170° F. An increase of the air velocity from 88.4 to 106.5 ft. per minute per square foot of column area, which amounted to a 20 percent increase, decreased the moisture differential across the column by 41 percent, which was 12 percent less than the previous moisture differential. A static pressure of 0.7 in. of water is required to produce an air flow of 90 cu. ft. of air per minute through a square foot of corn column. The total static pressure which the fan must operate against will be approximately 1 in. of water, as a pressure of from 0.2 to 0.3 in. of water will be required to force the air around the furnace through the duct system.

The two most important factors affecting the quantity of corn which can be dried in a shelled-corn drier are first the temperature of the drying air, and second the velocity of the drying air in the column. The air temperature should be kept as high as practicable in order to get the maximum output from any given size of drier. A temperature of from 170° to 180° is recommended. To keep the moisture differential across the column of corn at 4 percent or below requires that an air volume of approximately 90 cu. ft. per minute be maintained through each square foot of corn column. At this velocity through the corn column the exhaust air retains considerable drying capacity and requires a relatively small amount of heat to bring it up to the operating temperature of the drier. The amount of heat required to dry 1 ton of shelled corn from 30 percent moisture content to 12 percent moisture content in a continuous-process drier was found to be approximately 1,334,000 B. t. u. The power cost for driving the fan, operating the grain-removing mechanism, and elevating the grain into the drier was approximately 40 ct. per ton at an electrical rate of 3 ct. per kilowatt hour.

General information is given also on operation, as well as plans and operating characteristics for an ear-corn drier.

[Irrigation waters, water supply, and flood control work]. (Partly coop. U. S. D. A. et al.). (*Utah Sta. Bul. 282 (1938), pp. 70, 85–88, 103–110, 113, figs. 6*).—These investigations have covered water studies (salinity of irrigation waters) and chemical content of irrigation water; water shortage, the amount of water which can safely be developed in any basin for a continuous supply, irrigation studies, water application and crop yield, and snow surveys and irrigation; soil water problems; and flood prevention studies.

AGRICULTURAL ECONOMICS

Rudimentary mathematics for economists and statisticians, W. L. Crum (*Quart. Jour. Econ., 52 (1938), Sup., pp. [1]+164, figs. 49*).—"The material of the book has been organized to develop the mathematical topics from the simplest types of charting of elementary algebraic expressions and related notions of analytic geometry through the central and vital treatment of limits and rates and derivatives up to a brief consideration of the location of maxima and minima and the formulation and solution of simple problems by the method of differential equations."

Seventh International Management Congress, Washington, D. C., September 19–23, 1938: Agriculture (*Baltimore: Waverly Press, Inc., 1938, pp. [170], figs. [33]*).—Included are the papers presented at the Seventh International Management Congress, noted editorially (E. S. R., 79, p. 577). The papers by sessions were: Session 1, Land and soil resources—Rapporteur's Critique, by H. B. Sprague (pp. 1a–1c), The Management of Our Land Resources, by C. L. Holmes (pp. 3–6), The Management of Our Soil, by R. V. Allison (pp. 7–11), The Organization for the Reclamation of the Pontine Marshes [trans. title], by F. Angelini (pp. 12–16, Eng. abs. p. 12), The Technical Agrarian Organization of the Pontifical Management of Castel Gandolfo [trans. title], by E. Cremonesi (pp. 17, 18, Eng. abs. p. 17), The Rationalization of Bulgarian Agriculture [trans. title], by B. Ilieff (pp. 19, 20, Eng. abs. p. 19), and The Rationalization of Agricultural Production [trans. title], by H. Merkel (pp. 21–24, Eng. abs. p. 21); session 2, crops and forests, their production, protection, and use—Rapporteur's Critique, by D. F. Jones (pp. 25a, 25b), Utilization of Plant Resources, by D. F. Jones (pp. 27–29), More Efficient Plants, by E. F. Gaines (pp. 30–33) (Wash. Expt. Sta.), The Control of Plant Diseases, by H. S. Fawcett (pp. 34–38), The Control of Economic Insects, by T. J. Headlee (pp. 30–41) (N. J.), Economic Utilization of Oak by the Quantitative Method, by A. Jančík (pp. 42, 43), The Analysis of Price Experience and Its Use for Farm Management Purposes, by K. A. H. Murray (pp. 44–48), and Value of Measurements of Physical Outputs for Economic Farm Management, by A. W. Ashby and J. H. Smith (pp. 49–51); session 3, farm animals, their breeding, nutrition, and use—Rapporteur's Critique, by F. B. Morrison (pp. 53a–53c), The Management of Our Livestock Resources, by W. C. Coffey (pp. 55–58), The Growing of Better Animals, by H. C. McPhee (pp. 59–61), The Nutrition of Farm Animals, by F. B. Morrison (pp. 62–64), Diseases and Parasites of Farm Animals, by J. R. Mohler (pp. 65–68), and How to Obtain the Highest Quality Milk at the Minimum Cost, by H. C. V. Rosam (pp. 69, 70); session 4, labor resources and their use on the land—Rapporteur's Critique, by E. A. White (pp. 71a–71c), Power Resources on the Farms of the United States, by E. A. White and J. P. Schaenzer (pp. 73–75), The Use of Power in Agricultural Production and Harvesting, by R. U. Blasingame (pp. 76–80), Use of Power in Distribution, by S. H. McCrory and G. R. Boyd (pp. 81–84), How to Interest the Farmer in More Intensive Production of Livestock, by C. Kucera (pp. 85–89), Rationalization and Unification of Working Methods in Economic Analyses of Agriculture [trans. title], by J. Ťukal (pp. 90–93, Eng. abs. p. 90), Scientific Management in the Use of Agricultural Machinery, by J. Paleologue (pp. 94–96), How Is the Interest of the Farm Laborer To Be Enlisted in Improving the Output of the Farm? by J. P. Dijkhuis (pp. 97–99), What is the Economic Ratio Between the Use of Animal and Motor Traction? To What Extent Can the Latter Be Increased? (pp. 100–109), and Agricultural Landed Properties Compared as Regards the Number of Working Days Employed, by S. Moszczenski (pp. 110–113); and session 5, economic and social factors in agriculture—Rapporteur's Critique, by H. W. Beers (pp. 115a–115c), Human Nutrition, by H. C. Sherman (pp. 117–119), Population Trends as Related to Management Factors, by O. E. Baker (pp. 120–127). The Influence of Management in the Economics of Agriculture, by P. E. McNall (pp. 128–132), The Influence of Climate on Management, by R. S. Kifer (pp. 133–137), The Vocational Agriculture Program in the United States, by H. O. Sampson (pp. 138–142), The Present Organization in the International Trade in Agricultural Products [trans. title], by N. Moch (pp. 143–147, Eng. abs. p. 143), Increasing the Efficiency of Drivers of Agricultural Machinery, by J. Paleologue (pp. 148, 149), Bases for the Determination of the Market Price of Agricultural Products, by C. P. G. Stevens (pp. 150–153), and The Rationalization of Agrarian Markets [trans. title], by H. Merkel (pp. 154–158, Eng. abs. p. 154).

[Articles and notes on agricultural economics] (*Jour. Farm Econ., 20 (1938), No. 3, pp. 563–709, fig. 1*).—Included are articles as follows: Farm Credit and Government, by E. C. Young (pp. 563–572); Social Welfare and Differential Prices, by G. J. Stigler (pp. 573–586), with rejoinder by F. V. Waugh (pp. 587–589); Trade and Trade Agreements Between Canada, the United States, and Great Britain, by W. M. Drummond (pp. 590–604); Some Technological Changes in the High Plains Cotton Area of Texas, by C. A. Bonnen and A. C. Magee (pp. 605–615) (Tex. Expt. Sta. and U. S. D. A.); The Soil and the Law, II, by P. M. Glick (pp. 616–640) (U. S. D. A.) (E. S. R., 80, p. 119); Determination of Sales and Lease Values of Private and Public Range

Lands, by M. Clawson (pp. 641–651); and Hillville—a Haven of Refuge, by C. C. Zimmerman (pp. 652–668). Notes are included as follows: Notes on the Census of Agriculture—Methods in Sample Census Research, by C. F. Sarle (pp. 669–672), A Technique for Regionalization of Agricultural Census Schedules, by D. W. Smythe (pp. 672–677), Census Data on Land Utilization, by G. S Wehrwein (pp. 678, 679), and The Agricultural Population: Realism vs. Nominalism in the Census of Agriculture, by T. L. Smith (pp. 679–687); Courses Offered and Levels of Registration in Agricultural Economics at Land-Grand Institutions, by R. J. Saville (pp. 687–694); A Test for the Independence of Groups of Agricultural Prices Applied to Hog, Cattle, Corn, and Oat Prices, by P. Di Salvatore (pp. 694–699); Farm Marketing Costs and Wage-Hour Legislation, by C. M. Elkinton (pp. 699–702); Indexes of Purchasing Power, by W. B. Garver (pp. 702, 703); Some Possible Uses for the Cooperative Western Range Survey in Economic Analysis, by M. H. Saunderson (pp. 703–705); and Some Factors Related to Tax Delinquency of Farm Real Estate in Kansas, by L. F. Miller (pp. 705–709) (Kans.).

Current Farm Economics, [October 1938] (*Oklahoma Sta., Cur. Farm Econ., 11 (1938), No. 5, pp. 95–125, figs. 4*).—Included are articles on The Business Situation, by M. Hill (pp. 96–98); Agricultural Situation (pp. 98–105); Crop Testing Plan for Oklahoma Wheat Improvement, by F. T. Dines (pp. 105–111); Stability of Farm Tenure Through Revision of Prevailing Rental Agreements, by P. Nelson (pp. 111–119); and Possibility of Avoiding Grain Storage Costs Through Purchasing of Futures, by A. L. Larson (pp. 120–123).

[Investigations in agricultural economics by the Utah Station]. (Partly coop. U. S. D. A.). (*Utah Sta. Bul. 282 (1938), pp. 17–25, figs. 2*).—Included are brief general summaries of findings in studies in farm management begun in 1914, of the apple industry in 1926–27, in an economic survey in Washington County in 1930, in price studies since 1926, in the family living expenditure study in Summit County in 1930, in a study of the cost of producing dry-land wheat in 1926–27 and 1933–34, in a study of the factors affecting the poultry industry and marketing, 1929–31, inclusive, and in the economic aspects of agricultural conditions in the Delta area of Millard County, 1929–31. A map shows the four major type-of-farming areas of the State. The economic studies under way in the Uinta Basin and Utah, Sanpete, and Sevier Counties are briefly described.

Foreign Agriculture, [October 1938] (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr., 2 (1938), No. 10, pp. 437–486, figs. 4*).—Included are articles on Soviet State Grain Farms, by W. Ladejinsky (pp. 439–454), and World Rice Production and Trade. by F. J. Rossiter (pp. 455–482), and notes on recent developments in foreign agricultural policy as follows: Ecuadoran Government to control banana industry, Poland adopts new cereal policy, Japan trades finished textiles for Australian wool, and Portugal encourages colonial cotton production.

The farm outlook for 1939 (*U. S. Dept. Agr., Misc. Pub. 333 (1938), pp. IV+44, figs. 15*).—This publication continues the annual information prepared by the Bureau of Agricultural Economics in cooperation with representatives of the State agricultural colleges for assistance of farmers in planning their crops and operations for the next year. The general outlook for demand for agricultural products, commodity prices, farm credit, farm labor, building materials, farm machinery, fertilizer, and farm family living are discussed, followed by a more detailed analysis as to cash crops—cotton, wheat, tobacco, fruit, truck crops for market and for canning, potatoes, sweetpotatoes, rice, flax, soybeans, clover and alfalfa seed, dry beans, peanuts, and tree nuts; feed crops—feed grains, corn, oats, barley, grain sorghums, and hay; and livestock and livestock products—meat animals and meats, hogs, beef cattle, sheep and lambs, wool, mohair, dairy products, chickens and eggs, turkeys, and horses and mules.

Business activity in South Dakota, 1915–1938, T. H. Cox (*South Dakota Sta. Circ. 24* (*1938*), [*pp. 5, pl. 1*]).—A table and chart show the monthly indexes, 1915–37, of business activity in percentages of predepression normals (1923–30). These are a composite of nine individual series (for which charts are also shown). The individual series include bank debits (check transactions), cattle sales, new car sales, life insurance sales, prices of farm products, hog sales, building contracts awarded, sheep sales, and electric power production. The construction of each individual series and the weights given each in the composite series are described.

A graphic summary of agricultural credit, N. J. Wall and E. J. Engquist, Jr. (*U. S. Dept. Agr., Misc. Pub. 268* (*1938*), *pp. II+48, figs. 66*).—This publication continues the series previously noted (E. S. R., 79, p. 408). The data presented in the charts and maps were obtained chiefly from reports issued by the U. S. Bureau of the Census and the Farm Credit Administration and publications of the Bureau of Agricultural Economics of the Department.

Studies in taxation in Delaware: The cost of State government, 1924 to 1937, M. M. Daugherty (*Delaware Sta. Bul. 211* (*1938*), *pp.* [*2*]+*101, figs. 32*).—Factual data obtained from the annual reports of the State auditor and the State highway department and the statutes of the State are presented in tables and charts by fiscal years 1924–37, inclusive, and discussed. The total receipts are classed as ordinary and extraordinary income and the disbursements as current and extraordinary expenditures. The expenditures and receipts in the component parts of the main classifications are shown in detail.

Tax delinquency and county ownership of land in South Dakota, R. B. Westbrook (*South Dakota Sta. Bul. 322* (*1938*), *pp. 63, figs. 7*).—Part 1, the tax calendar, discusses the assessment of real property and the procedures in handling delinquent property. Part 2 describes the interrelationship between certain physical factors, tax delinquency, high per capita expenditures, county and school district indebtedness, and public ownership of land. Part 3 discusses the rentals, taxes, maintenances, leases, and records in counties having county-owned lands. Recommendations are made for changes in the methods of handling the assessment of taxes, delinquencies., etc., and the supervision and control of county-owned lands.

Types of farming in New York, R. S. Beck ([*New York*] *Cornell Sta. Bul. 704* (*1938*), *pp. 71, figs. 52*).—This study was made to show the types of farming carried on in New York, the location of each type and the reason therefor, and the changes that have taken place in the types of farming. The principal sources of data were the U. S. Agricultural Census of 1935 and the New York State Census of 1875. Land use in the State, the crop and livestock trends, and the natural, economic, and biological factors affecting types of farming are described.

Of the land area of the State, about 61 percent was in farms in 1935. About 10 percent was State-owned in 1936. The number of farms increased to about 241,000 in 1880, but declined by 1935 to about 177,000. The total productive-man-work units in 1934 were calculated at nearly 50 million, of which 4 percent was spent on small grains, 9 on hay, 6 on corn, 12 on vegetables, 2 on other crops, 6 on fruits, 41 on cattle, 5 on poultry, 1 on other livestock, and 14 percent on work off the farm.

Cost and efficiency in fiber flax production in the Willamette Valley, Oregon, G. W. Kuhlman and B. B. Robinson. (Coop. U. S. D. A.). (*Oregon Sta. Bul. 354* (*1938*), *pp. 25, figs. 6*).—The status of the fiber flax industry in the world, the United States, and Oregon is described. Using data obtained regarding 124 flax fields, including 1,119 acres in 1934 and 84 fields including 735 acres in 1936, an analysis is made of the preharvest, harvest, and use of land costs; the labor requirements for different operations; the cash and noncash costs; and the major factors influencing costs and profits. Comparisons are made with the costs in 1935, an adverse year, and of yields over a period of years.

The average yield in 1934 and 1936 was 2.1 tons per acre and the average cost $36.18 per acre or approximately $17.50 per ton. The average yield for the period 1925–37 was 1.65 tons per acre. About two-thirds of the estimated costs are cash costs. The study indicated that the production in the Willamette Valley was conducted in a strictly modern manner, and that there was little opportunity for further reductions in cost; that flax has paid the grower for his labor and use of his land but not much more; that the high cash costs place considerable risk on the grower; and that the future of the industry and its ability to compete with foreign flax and other fibers hangs largely on the cost of processing. "In view of the risks involved in flax culture and the small hope of large profit above wages and rent for the land, large increases in flax production are not to be expected until such time as processing costs are lowered."

Economic studies of vegetable farming in New York, IV, V, J. N. Efferson ([*New York*] *Cornell Sta. Buls. 701* (*1938*), *pp. 45, figs. 7; 702* (*1938*), *pp. 41, figs. 6*).—The series is continued (E. S. R., 78, p. 711).

IV. *Production and marketing of cauliflower in Delaware County, 1936.*—An analysis is made of data obtained in a cost-of-production and farm-management study for the crop year 1936 of 100 farms and 409.62 acres of cauliflower in the Margaretville cauliflower area of New York. The more important business analysis factors for all farms and the farms in each section of the area are shown in tables, and a farm-management-efficiency program for the farms is outlined.

Average growing costs in 1936 were $242 and 57 ct. per acre and per crate, harvesting costs $48 and 11 ct., and marketing costs $241 and 57 ct. The average returns were $615 per acre and $1.45 per crate, and the average net gain was $84 per acre or 20 ct. per crate. The total man labor requirement per acre averaged 284 hr. for growing. 151 hr. for harvesting, and 5 hr. for marketing. The average return per acre for labor on cauliflower was 45 ct. per hour, varying from 31 ct. to 71 ct. in the four sections of the area studied. Of the 100 farms, 31 showed a loss on the cauliflower enterprise, while 11 made a gain of over $1,000 above all expenses, including labor.

V. *Production and marketing of lettuce in Oswego County, 1936.*—Cost records for 1936 were taken for 50 owner-operated farms and 10 farms operated on a share basis. Additional data were also available for a study of 39 lettuce farms in 1926 and 71 farms in 1927.

On the owner-operated farms, the average acreage in lettuce was 7.6 and the average yield 414 crates (2 doz. heads) per acre. The average costs per crate were growing 22 ct., harvesting 4 ct., and marketing 38 ct. The average return was 79 ct. per crate and the average net gain 15 ct. A total of 235 hr. of labor per acre were required for growing, harvesting, and marketing. The average return per hour of labor was 51 ct. The average labor income on the 50 owner-operated farms was $609 and on the share-operated farms $335. Acres in lettuce per farm and yields per acre of lettuce were the most important factors affecting the financial returns in 1936 on the farms studied.

Profitable poultry management, K. T. Wright (*Michigan Sta. Spec. Bul. 294 (1938), pp. 52, figs. 18*).—This study was made to ascertain the items of cost, physical requirements, and income in growing pullets and broilers and in producing eggs, and influence of poultry management practices or conditions on costs and returns per flock. It is based on 316 farmer-kept records during the years 1931–35 for broilers and pullets and 276 records for laying flocks for the years 1931–34. The records were obtained in the most important poultry regions of the State. The laying flocks averaged 318 birds when put into the laying house and 232 for the year and included 87,860 birds on October 1, 1931, and 34,014 birds on September 30, 1935. An analysis is made by years of the costs and returns per flock, per hen, and per dozen eggs, and comparisons are made of the costs in different areas of the State and with other States. An analysis is also made of the factors affecting the laying flock costs and returns and the cost of producing pullets.

The average net returns per laying flock for the years 1932–35 ranged from —$5.16 to $200.55, averaging $74.66, and the labor returns per hour from 14 ct. to 70 ct., averaging 37 ct. The net returns per dozen eggs varied from 0.1 ct. to 6.6 ct., averaging 2.4 ct. The average production of eggs per hen was 114 based on the number started and 157 based on the average number of hens during the year. Net costs, 1931–35, per pullet ranged from 49 ct. to 70 ct., averaging 58 ct. Of the total average cost of $2 34 per hen, 52 percent was for feed, 18 percent for depreciation in hens, 13 percent for labor, 7 percent for buildings and equipment, and 10 percent for other items. The average income per hen was $2.66. The average cost per dozen eggs was 17.9 ct., and the average income was 20.3 ct. Cost of chicks, feed, labor, etc., per 100 chicks was $38.41, and the average income from broilers, culled pullets, etc., was $16.02, making the average net cost for the 39 pullets raised $22.39. The most important factors affecting net returns were eggs laid per hen, fall egg production, feeding efficiency, death loss and culling percentage, and labor efficiency. The poultrymen scoring lowest on these 5 factors lost 21 ct. per hen, while those scoring highest had a net return of 86 ct. per hen. Of each 100 birds started in laying flocks, 19 died and 42 were culled, making the average number for the year 73. Of 100 chicks started, 14 died and 47 were sold as broilers and cull pullets. "Feeding efficiency of the poultryman and breed of poultry were very important factors influencing pullet cost. Mortality in raising the chicks had more effect on the laying flock returns than pullet cost, within reasonable limits. Hatching date of the chicks likewise had more influence on profits of the laying flock than on pullet cost. Thus, low mortality in the chicks was necessary for profits on the hens, and the slight increase in the net cost of early pullets was more than balanced by the higher egg income."

The cost of manufacturing and marketing evaporated milk, H. H. Bakken. (Wis. Expt. Sta.). (*Rio, Wis.: Rio Jour., [1938], pp. [4]+23, figs. 8*).—Tables are included and discussed showing by items by years 1929–32 the weighted average, raw and semiraw material, direct operating, marketing, and administration costs, selling price, and net operating profit or loss for a tall can of evaporated milk for 8 Wisconsin companies with annual milk receipts of from 25 to 49 million pounds, and the actual and estimated costs by years 1933–35 for companies with annual milk receipts of from 25 to 149 million pounds. Charts show by years 1929–35 the percentages that the several classes of costs were of the total sales.

The average net operating profit or loss per tall can for the 8 companies was 1929 —0.1879 ct., 1930 —0.0321, 1931 +0.0029, and 1932 —0.1306 ct., and that for all of the companies included for the period 1933–35 was +0.112 ct. in 1933, +0.1659 in 1934, and +0.0799 ct. in 1935.

Operating expenses of cooperative exchanges and elevators, H. M. Haag (*Missouri Sta. Bul. 401 (1938), pp. 48*).—This is a study of the costs and factors causing variations in such costs of 161 Missouri cooperative exchanges and elevators in 1935. Analyses are made of the expenditures for different classes of expenses; the variations in management and labor, fixed property, inventory, credit, and other expenses: and the relation of size of the associations to costs, sales per man, wage and salary level, fixed property turn-over, inventory turnover, days' sales outstanding, etc. The costs in small associations are analyzed and discussed.

Operating expenses averaged nearly $6 per $100 of sales, varying from $2 to more than $13. The expenses for one-half of the associations were between $5 and $7 per $100 of sales. Costs of the cooperatives were relatively low as compared with those of similar organizations in other States and of other retailers in the State. Management and labor constituted 50 percent of the total expenses, fixed property expenses 20 percent, general expenses 10 percent, and inventory, credit, and net truck expenses each about 5 percent. Management and labor expenses varied from 99 ct. to $7.46 per $100 of sales. Fixed property expense per unit of sales was lowest where buildings were rented rather than owned. Those of the associations owning buildings varied from 11 ct. to $6.28 per $100 of sales. Little, if any, interrelationship was found between the various operating ratios or measures of efficiency. Sales per man employed and fixed property turn-over had considerable influence on total expenses. Type of business had little effect on the cost of doing business.

Washington pears on the New York and Chicago fruit auctions, H. F. Hollands (*Washington Sta. Bul. 361 (1938), pp. 35, figs. 9*).—"This publication presents a brief report concerning pears shipped from the State of Washington during the eight crop years 1928–29 through 1935–36 and sold on these two auction markets. Quantities of the different varieties and grades of pears and the seasonal sale of the important varieties are examined and comparisons made between the two auctions. The important production areas of the State are compared with respect to tree numbers, varieties, ages, and to volumes of different varieties of pears shipped to the two auctions. The effects of shipping districts and of size of fruit on pear prices are examined for the sales of selected varieties on the New York auction. Price comparisons are made among different varieties and grades of pears on the two auction markets."

Grading dressed turkeys, T. W. Heitz (*U. S. Dept. Agr., Farmers' Bul. 1815 (1938), pp. II+36, figs. 19*).—This describes and discusses the United States standards for dressed turkeys, the general rules applying to all classes and grades and as to packing, the defects and deformities to be considered in grading, weight specifications, and the Government grade label, stamp, and grading certificate.

Crops and Markets, [October 1938] (*U. S. Dept. Agr., Crops and Markets, 15 (1938), No. 10, pp. 209–232, fig. 1*).—Included are crop and market reports on cotton, dairy and poultry products, feedstuffs, seeds, grains, and livestock and livestock products of the usual types.

International yearbook of forestry statistics, 1933–35.—II, America (*Internatl. Inst. Agr. [Roma], Internatl. Yearbook Forestry Statis., 1933–35, vol. 2, pp. XI+201*).—This second volume (E. S. R., 77, p. 416) includes summary and detailed tables regarding forest areas and trade in wood for North, Central, and South America. Many of the data relate to a more recent date than 1935. A table includes the commercial, common or vernacular names, the scientific names, and zones of origin of some wood species in Argentina and Mexico.

International yearbook of agricultural legislation, 1937 [trans. title] (*Inst. Internatl. Agr. [Roma], Ann. Internatl. Lég. Agr., 27 (1937), pp. XXXVI+1049*).—This volume continues the series previously noted (E. S. R., 78, p. 877).

RURAL SOCIOLOGY

Trends in extension sociology, H. W. Beers (*Rural Sociol., 3 (1938), No. 1, pp. 34–41*).—Rural sociology should be an integral part of the extension structure, not merely an accessory. Its chief obligation to extension work is to help orient the whole program. The trend in extension work from solitary activity of specialists to a group or clinical approach provides a new opportunity to make this contribution. Rural sociology should contribute also some of its careful research attitudes and analytical methods to extension work. Finally, rural sociology, in cooperation with other fields, should approach the solution of what laymen call "social problems."

Some problems of the extension rural sociologist, D. E. Lindstrom (*Rural Sociol., 3 (1938), No. 1, pp. 42–47*).—Extension work in rural sociology carried on under the Smith-Lever Act enacted in 1914 is relatively new. The earliest efforts predated the enactment of the law, however, probably beginning in New York, Missouri, Iowa, and Wisconsin. Administrators are now facing problems in human and group relationships as never before. The more specific and concrete the help offered by the rural sociologists the more their assistance will be sought and used. Problems faced by extension rural sociologists relate to the development of a program which will fit into the terms of the Smith-Lever Act, include efforts to reinterpret and make of practical use subject matter from the field of sociology which calls for judgment as to what subject matter to use, and pertain to relating the work in rural sociology to other fields of extension work. The interests of the extension rural sociologist differ in degree only from those of the research worker or teacher. There is need for placing values upon findings so that they may be applied to practical situations in the field.

Rural sociology (*Utah Sta. Bul. 282 (1938), pp. 117–121, fig. 1*).—This brief résumé of work carried on since 1926 includes findings as to housing conditions, social participation, the constitution of rural groups, standards of living, and community assets.

The census of agriculture, M. R. Benedict et al. (*Social Sci. Res. Council Bul. 40 (1937), pp. XIII+76, fig. 1*).—This report was prepared jointly by the Social Science Research Council and the American Farm Economic Association. It seeks to give research workers in agriculture a better understanding of the purposes, problems, and limitations of the agricultural census and to point out certain lines of improvement both in the taking and use of agricultural census data. It also suggests certain lines of research which seem to be needed in developing both a better census and a wiser and fuller use of the data secured in past and future enumerations.

Changes in North Dakota farm population during 1936 and 1937, D. G. Hay (*North Dakota Sta. Bimo. Bul., 1 (1938), No. 1, pp. 15–18, figs. 2*).—A decrease of 16,000 during 1936 and 14,000 during 1937 is estimated, with a discussion of this and related details.

The influence of intra-State regional characteristics upon population growth, L. B. Tate (*Rural Sociol., 3 (1938), No. 1, pp. 57–68, figs. 2*).—Population growth, when measured by census changes or natural gain, tends to show wide variations from region to region. This is particularly true in Virginia, where the more or less natural and traditional areas are so different in historical background and provincial characteristics. Since 1870 Virginia's regional population growth has ranged from one-tenth of 1 percent in the middle peninsula of Tidewater to over 200 percent in the two extreme western regions and the two extreme southeastern regions. Several modifying factors show a relationship with these changes. The smallest growth is associated with an old region which was once the home of aristocratic planters but today is relatively poor. The large gains are associated, first, with two newer regions which have fairly abundant resources and a preponderance of white inhabitants, and, secondly, with two old regions now highly urbanized and dotted with resorts and army, navy, and aviation concentration points.

The movement to southern farms, 1930–35, C. Taeuber (*Rural Sociol., 3 (1938), No. 1, pp. 69–76, fig. 1*).—Despite high reproduction rates the farm population in the Southern States in 1935 was only slightly greater than in 1910, and between 1920 and 1930 there were decreases in 9 of the 13 States. Continued migration from farms to cities and towns in all parts of the country occurred both before and after 1930. These States contributed nearly 60 percent of the net migration from farms to towns and cities between 1920 and 1930, but received only one-third of the persons who moved from nonfarm territory to farms after 1930 and were still there by 1935. The landward movement was largely to the fringes of urban or industrialized areas. Negroes were a much smaller proportion of the landward migrants of the thirties than of the migrants to urban areas during the twenties.

Iowa incomes as reported in income tax returns, M. G. Reid and V. Britton (*Iowa Sta. Res. Bul. 236 (1938), pp. 113–189, figs. 16*).—Comparisons are made of the percentages of the population in the United States and Iowa filing Federal income returns 1927–34, inclusive; of the proportions of population in Iowa and bordering States having taxable incomes; and the average net taxable incomes and sources of income and deductions in the United States and Iowa. The requirements, rates, and deductions under the Iowa State income tax law are described, and a table is included showing the numbers and percentages of taxable incomes in 1934 and 1935 by income groups. An analysis is made of a random sample of 9,764 Iowa returns for 1934, the rates being classified by size of income, occupation, population of community, and number of dependents. The distribution of the incomes, the sources, and average size were studied.

The proportion of the Iowa population with taxable incomes under the Federal law is lower than that for the United States. During recent years it was considerably lower than that in bordering States except Kansas and South Dakota. The average taxable income in Iowa is lower than that of the United States. The reported incomes were more nearly equal in Iowa. Nearly 80 percent of the taxable incomes under the Iowa income tax law were under $2,000. The number of taxable incomes increased 11 percent from 1934 to 1935, the greatest increase being in the $5,000 and over income group. The larger the town the larger the proportion of population filing returns. In rural communities the number of taxable returns in 1934 correlated closely with the average value of farms in 1935. The average net income of all returns was $1,597, being $1,260 for farmers and $1,634 for other persons. General clerks, chauffeurs and truck drivers, laborers, retired farmers, and the groups comprised largely of women had lower average incomes than farmers. Rents and royalties were fairly common sources of income in all occupational groups. For the cases where the income was reported in detail, interest, rents and royalties, and dividends constituted 9.5 percent of the net income of farmers, 18 percent for business executives and managers, 20 percent for real estate and life insurance agents, 4.2 percent for engineers, 3 percent for mechanics, and 94 percent for retired farmers. Nearly 5 percent of the net income reported by farmers came from "interest", as compared with 3.1 percent for other persons. No consistent relationship between income and number of dependents appeared in the occupational groups. Farmers reporting 7 or more dependents had a higher average income than those with fewer dependents, but for all returns families with 3 dependents had the highest average income.

The standard of living of farm and village families in six South Dakota counties, 1935, W. F. Kumlien, C. P. Loomis, Z. E. Bankert, E. deS. Brunner, and R. L. MacNamara. (Coop. U. S. D. A. et al.). (*South Dakota Sta. Bul. 320* (*1938*), *pp. 63, figs. 20*).—This study was based on data obtained from 25 sample areas within 6 South Dakota counties, typifying, respectively, 6 different sections of the State. With rising incomes the proportions spent for food, housing, and maintenance decreased while the proportions spent for automobiles, health, and advancement increased. There was least change in the proportions spent for clothing and incidentals. More of the family living was produced directly in the open country than in the village. The open-country families used a much greater proportion of their income for food and automobiles. The village families allocated a greater proportion of their income to housing and maintenance, clothing, advancement, and health. Only a small proportion of rural families had running water, electric lights, central heating systems, and telephones. The larger farms in the area were usually equipped with a greater number of home conveniences. The standard of living is usually higher in those tenure and residence groups where the male heads and homemakers have had the most education.

The present social status of American farm tenants, E. A. Schuler (*Rural Sociol.*, *3* (*1938*), *No. 1, pp. 20–33*).—Social status, for the purposes of this contribution, is defined as based on a hierarchic division of society into classes which differ quantitatively, qualitatively, or both, regarding (1) social privileges received and obligations borne, (2) goods and services consumed, (3) respect received and prestige held, and (4) ideology and class solidarity. An analysis of the findings reported in about 50 studies appearing since 1922, dealing chiefly with consumption data and representing conditions in 21 States, showed that (1) southern tenants (not including sharecroppers) consistently occupied a status lower than that of southern owners and (2) northern tenants did not consistently occupy a social status lower than that of northern owners.

Migratory farm labor and the hop industry on the Pacific Coast, with special application to problems of the Yakima Valley, Washington, C. F. Reuss, P. H. Landis, and R. Wakefield (*Washington Sta. Bul. 363* (*1938*), *pp. 64, figs. 20*).—A discussion of a local labor problem on the Pacific Coast.

Rural youth studies in the United States, R. M. Williams (*North Carolina Sta., AE–RS Inform. Ser. No. 4* (*1938*), *pp.* [*1*]+*14*).—Increased comparability of data in studies of youth is deemed desirable in view of the present handicaps to the synthesis of such research. The factual studies which have been made have been quite valuable as empirical guides for action programs in local areas. It seems clear that enough has been done to call for an inventory of the results achieved and for an attempt to orient youth studies somewhat more specifically toward the end of contributions to the body of sociological generalizations. Certain studies, particularly in anthropological and sociopsychological fields, have indicated lines of research which hold possibilities for the development of a definite theoretical framework. Additional studies proposed are institutional influences and relationships, developmental studies which would emphasize changes in social role and personality characteristics at various ages, special group studies designed to indicate the status and needs of particular racial, social class, and regional groups, and studies of social movement among youths, including types of organizations and leadership, ideologies and propaganda technics, factors affecting growth of specific types of movements, and relation of social movements to personality characteristics.

Rural youth and the Government, A. Williams (*Rural Sociol., 3 (1938), No. 1, pp. 3–10*).—More than 2.5 million rural young people have had to be assisted in some way by the Federal Government since 1933. This situation is the result of long-time trends which were brought into bold relief by the depression. In the past rural youth escaped from the effects of these trends by either migrating to new lands now no longer available or to cities unable to absorb as many rural youth as formerly. The result is a "piling up" of youth in rural territory. The educational and work programs of both the National Youth Administration and the Civilian Conservation Corps have supplemented the schools and the economic system. Through these programs the Federal Government has admitted its responsibility for removing the economic barrier to education on the high school level and above for youth in low income families, as well as the responsibility to provide vocational training, work experience, and wages to youth from relief families who are unable to obtain employment. The Government's obligation to its citizens in the field of recreation received an impetus during the years since the initiation of the emergency programs. A responsibility to youth not yet discharged adequately by the Government is the presentation of facts for discussion of present-day problems and government. There is a demand among rural youth for such discussions. Requisites to proper discharge of the Government's responsibility to youth in any area of activity are adequate facts, including uniform data gathered periodically, upon which to base policies and a body of public opinion sanctioning the assumption of responsibilities to youth expressed through the elected representatives of the people in Congress.

Social security as a function of society, J. H. Kolb (*Rural Sociol., 3 (1938), No. 1, pp. 11–19*).—In the social heritage of rural America there is the tradition that no one shall starve but at the same time no one shall be allowed to depend solely upon others without rendering some service in return for help given. Research on a national scale has resulted in the collection of facts and description of forms and procedures but has produced little organic thinking concerning the fundamental concepts or the deep-going process of society in crises. There is immediate need to coordinate detailed knowledge and to relate it to life. With analysis must go synthesis and service. Along with thoroughgoing studies of social situations there must go reformulation of concepts whose roots lie deep in the culture and whose outward forms can be understood and accepted today. The entire activity of the State or society in the welfare field hinges upon the matter of the handicap, and in removing handicaps the basis of help must be one of need rather than one of right. The family rather than the individual should be the unit of social treatment. To preserve and to expand the traditional spirit of neighborliness and to achieve the self-dependence of the people is the beginning and end of all public welfare and social security.

Toward farm security, A. G. Black (*U. S. Dept. Agr., Misc. Pub. 308 (1938), pp. 23, figs. 10*).—The author discusses farm security from the viewpoint of stability of farm prices and incomes, physical security, security against crop losses, security of land tenure, farm laborers, and stability of land values.

Social and economic circumstances of accepted applicants for old-age assistance in South Dakota, 1936–1937, J. P. Johansen (*South Dakota Sta. Bul. 323 (1938), pp. 55, figs. 8*).—Facts and figures concerning the condition of applicants for old-age assistance in the State are presented.

A social and economic study of relief families in Ottawa County, Oklahoma, 1934, R. T. McMillan (*Oklahoma Sta. Tech. Bul. 2 (1938), pp. 60, figs. 10*).—Approximately one-half the population in the county, as reported in the 1930 census, was receiving relief in December 1934. Unemployment was the chief reason given for the need of relief by 46 percent of the households, drought by 20 percent, about 24 percent were widows, aged, and disabled persons, while the remaining 10 percent blamed undersized farms, low farm income, poor land, or lack of adequate farming equipment. The 1,511 relief households surveyed averaged 4.2 persons, the rural having 4.5 persons as compared with 3.8 persons in urban households. Of the total number of families 73 percent were classed in the normal family type, 16 percent in broken families, and 11 percent in the nonfamily type.

At least one-twelfth of relief heads were separated or divorced. The proportion of widowed female heads exceeded that of male heads in the same classification by 4.5 times. Relatively few single persons were on relief. Domestic discord and tension were less noticeable in the rural than in the urban households. The age distribution of relief heads showed that 45 percent were 45 yr. of age or over. Farm owners, farm laborers, white-collar workers, and those heads without a usual occupation were represented preponderantly in the age groups over 44 yr. Farm tenants, miners, and unskilled laborers were concentrated in the younger age groups.

In the total relief population studied 53 percent were under 25 yr. of age, two-thirds of whom resided in rural communities. Over one-fourth of the males and nearly one-fifth of the females between the ages of 16 and 24 yr. had not reached the eighth grade in school. Less than one-third of the persons in this age group had completed the eighth grade.

Ownership of home or farm was reported by 24 percent of the families. Approximately one-half of the farms operated by relief families were less than 50 acres in size. One-third of the owners and one-fourth of the tenants had no work stock. One-sixth of the farm operators had no milk cows. Seven-eighths of the farm households kept poultry. Scarcely one-fourth of the farm operators possessed a combination of plow, harrow, cultivator, and wagon, and a large majority were without any of these implements except the plow. The average indebtedness of all households reporting debts was $159.

An analysis of the history and amount of relief advances indicated discrimination had been practiced against large size families with regard to the length of time families were advanced relief and in the amount of advances.

Permanent subsidy from public sources is regarded as inevitable. However, a more intensive use of agricultural resources and the strengthening of social organization in the lower economic levels appear to be steps whereby public agencies could effect material reductions in relief costs. Rehabilitation plans are discussed.

The membership of farmers in New York organizations, W. A. ANDERSON (*[New York] Cornell Sta. Bul. 695 (1938), pp. 28, figs. 4*).—This study of the membership in organizations of 2,925 New York farm operators indicates that farm operators belong to an average of 1.8 organizations each. Two out of each 10 belong to no organizations at all; 3 of 10 belong to only 1. About 1 in each 10 is a member of 4 or more organizations, but membership in 3 organizations appears to be the upper limit for most farm operators. From 1 to 2 in each 10 have never belonged to any organizations, while 2 in each 10 have never belonged to more than 1. Farmers are loyal to those organizations in which they are members and do not ordinarily drop membership. The organizations in which memberships are held, in order of their numerical importance, are the church, grange, Dairymen's League, farm bureau, lodge, other cooperatives, and the social-civic group.

Community buildings for farm families, B. HALBERT (*U. S. Dept. Agr., Farmers' Bul. 1804 (1938), pp. 11+41, figs. 36*).—This supersedes Farmers' Bulletin 1173 (E. S. R., 44, p. 888) and brings together the experience of recent projects in the development of community-building programs. Its purpose is to acquaint rural communities that need these buildings with successful building programs in other places.

Human and physical resources of Tennessee.—XXVI, Churches and church auxiliaries, C. E. Allred, S. W. Atkins, and F. M. Fitzgerald (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol. Dept. Monog. 78 (1938), pp. V+391–420, figs. 6*).—Church membership in Tennessee and the United States as a whole is keeping pace with the general increase in population. The East Tennessee Valley, the Central Basin, and most of west Tennessee lead in the density of church membership and in the percentage that total church membership is of the total population. Factors usually favoring low church membership in the State are a low degree of urban development, low per capita wealth, low agricultural productivity, relatively low farm incomes, poor transportation facilities, fewer Negroes, and a smaller percentage of homes equipped with various types of modern conveniences.

In 1926 the average church in Tennessee had 119 members, compared with 156 for 13 of the 14 Southern States and 235 for the United States. In 1906 the average size of church in Tennessee was 88 members. During the period 1906–26 the number of churches increased only 7 percent compared with an increase in church membership of 45 percent.

Church buildings in the State were valued at $54,537,000 in 1926, which was equivalent to one-fourth of the total value of all farm buildings.

Fifty-two percent of the urban population have membership in some church compared with 35 percent of the rural population. In 1926 there were 602,776 members of Sunday school organizations in the State, which represented the equivalent of 60 percent of the total church membership. These were located largely in urban or thickly settled areas. Tennessee has a large number of small country churches whose membership is too small to amply support a strong church program. It has been suggested that many small churches pool their resources and employ better qualified ministers.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Buildings and equipment for vocational agriculture instruction, M. R. Wilson (*Kans. Engin. Expt. Sta. Bul. 36 (1938), pp. 32, figs. 15*).—The planning of vocational agriculture buildings and the arrangement and design of shop, classroom, and office equipment are described and suggestions made.

Developing men and methods for the food industry, E. H. Wiegand. (Oreg. State Col.). (*Food Indus., 10 (1938), No. 6, pp. 316, 317, figs. 2*).—A food industry laboratory and courses, specialization of which leads to the degree of bachelor of science in food technology, are briefly described.

Curriculum development in education for home and family living: Purposes and procedures (*U. S. Dept. Int., Off. Ed. Misc. 2087 (1938), pp. [1]+VI+128*).—"This publication—the first of the two miscellanies—covers primarily the purposes which have dominated curriculum development programs, the phases of study which have been carried on in different situations, the sequences and organization used in some State and city curriculum development programs, and types of criteria for evaluating programs which may be carried on." It was prepared by B. I. Coon.

North America, L. R. Jones and P. W. Bryan (*London: Methuen & Co., [1938], 5. ed., rev., pp. XVI+578, [pl. 1], figs. 120*).—This is the fifth edition revised of the volume previously noted (E. S. R., 53, p. 397). Several new chapters have been added to part 2, economic geography. Some chapters in part 2 and part 3, regional geography, have been largely rewritten, and the others have been supplemented and revised and the statistics brought down to date.

Management of dairy plants, M. Mortensen (*New York: Macmillan Co., 1938, rev. ed., pp. IX+407, figs. 58*).—This revision of the volume previously noted (E. S. R., 44, p. 778) "represents what is included in the course of dairy plant management offered to undergraduate students in dairy industry at Iowa State College." Chapters are included on preliminary survey of conditions; organization; creamery construction; sewage disposal; refrigeration; mechanical refrigeration; steam and power; pasteurization; purchasing equipment and supplies; rent, depreciation, interest, and insurance; the personnel; factory control; the milk and cream supply; procurement of milk and cream; standardization of milk and cream; standardization of ice cream and cheese; standardization of butter; overrun; mechanical losses and their influence on butter overrun; manufacturing costs; marketing of dairy products; special marketing problems; advertising dairy products; and credits and collections. Each chapter is followed by problems and references and suggested readings. Chemical and bacteriological tests are described in an appendix.

The marketing of farm products, L. J. Norton and L. L. Scranton (*Danville, Ill.: Interstate, [1937], pp. [8]+378, figs. [18]*).—The general aim of this textbook for students of vocational agriculture is "to deal with the marketing problems of the individual rather than to prepare a treatise on the theory of marketing or a manual of information for some particular branch of the subject." The 30 chapters are analyzed in 7 parts as follows: The farmer and his market, the principles of price determination, the principles of cooperative marketing, commodity marketing—livestock, commodity marketing—grain, commodity marketing—other products, and a seventh dealing with governmental assistance on marketing problems, recent legislative developments affecting marketing and prices, and financing marketing. "Two types of material are included in each chapter. First, there is a general discussion of the underlying theory or a discription of the facts involved in the subject under discussion. Second, problems are set up, the answers to which require the student to use this material and to apply the lessons involved to concrete local problems. Some statistical data taken from government publications are included because they are more likely to be used than if a mere reference is given to them."

FOODS—HUMAN NUTRITION

Foods: Their nutritive, economic, and social values, F. L. Harris and R. A. Henderson (*Boston: Little, Brown & Co., 1938, pp. XI+631+[1], pl. 1, figs. 159*).—In this high school textbook the material is divided into sections dealing with nutrition, meal planning, food preparation, etiquette and entertaining, marketing, standards for buying foods, kitchen planning, and eating at home and abroad. The reference section contains tables on approximate food values and body measurements, suggestions for conducting animal nutrition experiments, laboratory rules in food preparation, recipes, stamps and seals used in marketing, a list of shops which sell foreign foods, and a list of films for use in teaching home economics.

The forty-second report on food products and the thirtieth report on drug products, 1937, E. M. Bailey (*Connecticut [New Haven] Sta. Bul. 415 (1938), pp. 677–719*).—In this annual report of routine analyses of foods and drugs (E. S. R., 78, p. 562), particular attention is again given to analyses for vitamin C content of commercial brands of orangeade, other fruit juice products, and tomato juice. Other reported analyses include the moisture, ash, protein, fat, and milk solids-not-fat of 6 samples of bread as delivered to city school cafeterias; the protein and carbohydrate content of 2 samples of so-called reduced carbohydrate bread as compared with average analyses of gluten bread and ordinary white bread; and analyses of 14 samples of mayonnaise and 9 of salad dressings, with calculated composition in terms of essential ingredients.

[Food and nutrition studies by the Utah Station] (*Utah Sta. Bul. 282* (*1938*), *pp. 89, 90, 91, fig. 1*).—A brief historical sketch is given of the program of research from 1926 to 1938 dealing with nutrition problems of farm families in the State from an early study of farm family food practices to the most recent work still in progress on vitamin C metabolism and the vitamin C content of common foods, and of the studies on the suitability of milk from various sources for the use of infants and invalids which led to the extensive research on soft-curd milk and the development of a curdometer for measuring the degree of curd hardness.

A comparison between the standard basic and malt-phosphate-bromate baking methods on 1937 North Dakota hard red spring wheat, R. H. Harris and T. Sanderson. (N. Dak. Expt. Sta.). (*Cereal Chem., 15* (*1938*), *No. 3, pp. 380–390*).—Flours from 89 samples of the 1937 crop of North Dakota hard red spring wheat were tested for ash and protein contents and diastatic activity and were baked into loaves, using the A. A. C. C. standard formula and the malt-phosphate-bromate formula, with 5 percent in place of 3 percent sucrose. The loaves were compared in volume, color, and texture. A close positive correlation was found between the wheat and flour proteins and also between the flour protein and the loaf volume as obtained by both baking methods. The correlation was significantly higher for the malt-phosphate-bromate method, which also gave an increase in volume and color of the loaf and with the higher protein flours a coarser texture. It is concluded that flour protein can be predicted with sufficient accuracy for practical purposes from a knowledge of the wheat protein and vice versa.

A comparison of two sizes of baking pans on 100-gram flour doughs producing large loaf volumes, H. Miller and A. G. O. Whiteside (*Cereal Chem., 15* (*1938*), *No. 3, pp. 402–406, figs. 2*).—A comparison was made of the A. A. C. C. low form pan with a pan slightly larger than the one described in a previous report (E. S. R., 77, p. 562), using two commercially milled and three experimentally milled flours containing from 12.9 to 17 percent protein in the A. A. C. C. standard baking formula.

The large pan produced more uniformly shaped loaves with a more open but uniform crumb structure and the absence of large holes under the crust, but did not decrease the variability in the results obtained on different days and did not appreciably change the loaf volumes. The low pan gave better results with loaf volumes under 700 cc.

The march of expansion and temperature in baking bread, C. H. Bailey and E. Munz. (Minn. Expt. Sta.). (*Cereal Chem., 15* (*1938*), *No. 3, pp. 413–418, figs. 3*).—In a series of tests with pan and hearth breads made with a low diastatic flour and with and without 0.37 percent wheat malt, observations were taken on the internal temperature and the height of the loaves during baking, and since the changing height is approximately proportional to the increase in volume, the relative increase in displacement of the dough was determined. During the first 10 min. in the oven, when the internal temperature of the dough had not exceeded 50°–60° C., approximately 80 percent of the expansion took place. The hearth bread behaved similarly during the first 12–14 min. of baking. The loaf temperature continued to rise during the next 10–12 min. to reach 100°. The "spring" or expansion is attributed to the thermal expansion of the gases or vapors present in the dough and the acceleration of enzymic phenomena during the early stages of baking, which increased the production of gas before the dough became rigid.

The relation of flour strength, soy flour, and temperature of storage to the staling of bread, W. R. Steller and C. H. Bailey. (Minn. Expt. Sta.). (*Cereal Chem., 15 (1938), No. 3, pp. 391–401, figs. 20*).—Two batches of bread made from four flours of varying strengths, with and without 1½ percent defatted soybean flour, were fermented, baked, cooled 1 hr. at room temperature, wrapped and sealed in waxed paper, and stored at 11°, 28°, and 42° C. The three methods of measuring staleness before and after storage were a measure of the firmness of the crumb by compressibility, a determination of the swelling power of the crumb by sedimentation, and a measure of the viscosity of a 10 percent suspension of finely ground crumb.

While the results obtained by the three methods agreed fairly well, the compressibility method showed greatest effects of flour strength and temperature of storage. The sedimentation method proved to be insensitive to small differences in the condition of the crumb. The rate of staling and the final degree of staleness became less as the storage temperature was increased from 11° to 42° during a 4-day period. The most rapid staling took place during the first 8–12 hr. after the loaves were removed from the oven. After 24 hr. the bread stored at 11° had almost reached its maximum firmness, while that stored at 42° was still quite fresh and after 96 hr. was not as firm as that kept at 11° for 24 hr. The addition of soybean flour to the dough tended to retard the staling process, and the bread held at 42° remained fresh from 4 to 24 hr. longer than did the regular bread. The strength of the flour appeared to be a factor in staling, with the bread containing high protein flour showing less rapid changes in the crumb. The bread made from semihard wheat flour staled less rapidly than did bread made from soft wheat flour, indicating that protein characteristics may also be a factor in the staling process.

Effect of storage on leaching of minerals and nitrogen from asparagus and peas during cooking, H. M. Fyler and J. T. Manchesian (*Hilgardia [California Sta.], 11 (1938), No. 7, pp. 295–314, figs. 4*).—Crude fiber and mineral determinations were made on raw and cooked 400-g samples of asparagus of the Palmetto variety and peas of the Giant Stride Variety when fresh and after periods of storage (varying from 24 to 240 hr.) under controlled conditions of humidity and a temperature of 35° F. Puncture tests were made on sample peas at intervals during the storage period. The vegetables were cooked in boiling distilled water in aluminum vessels for the boiling process and by steam in perforated aluminum disks for the steaming process.

The boiling process leached approximately four times as much magnesium, calcium, and phosphorus from the asparagus as the steaming process and twice as much magnesium and phosphorus from the peas but only slightly more calcium. More nitrogen was leached during boiling than during steaming. While the amounts of copper and iron were so small that the results were not sufficiently reliable to include, the analyses show practically the same amount of leaching by both cooking processes for the asparagus and less leaching for the steamed than for the boiled peas. The rate of leaching in the asparagus during both cooking processes decreased rapidly in the first 48 hr. and then more gradually as the storage period progressed. The peas did not show the initial rapid decrease in the rate of leaching. The crude fiber content of the asparagus did not vary measurably during the storage period, but the peas became firmer, particularly during the first 24 hr. of storage. The peas and asparagus cooked by either method after 48 hr. of storage retained more of their mineral constituents than when cooked immediately after harvesting.

Since more nitrogen was leached from the peas than from the asparagus and since the process of boiling caused greater leaching than did the steaming, it is concluded that the rate of leaching is dependent not only on the particular element but also on the amount of water coming in contact with and passing through the vegetable.

The availability of calcium from Chinese cabbage (Brassica pekinensis, Rupr.), H. C. Kao, R. T. Conner, and H. C. Sherman (*Jour. Biol. Chem., 123 (1938), No. 1, pp. 221–228*).—Calcium determinations were made on the bodies, with the exception of the intestinal tracts, of a group of rats maintained for 32 days on diet 13 consisting of one-third skim milk powder with butterfat added separately and two-thirds ground whole wheat, with sodium chloride equivalent to 2 percent by weight of the wheat and of another group receiving the diet with half of the skim milk powder replaced by sufficient Chinese cabbage to supply an equivalent amount of calcium. The average calcium utilization factor was 0.8 for male and 0.78 for female rats receiving the Chinese cabbage as compared to 0.88 for both sexes on the skim milk diet. It would appear that Chinese cabbage is an excellent source of calcium, with an available calcium content approximately nine-tenths that of whole cow's milk. Chemical analysis showed that the dried Chinese cabbage contained 0.84 percent calcium, 0.74 phosphorus, and 19.55 percent protein as compared to 1.28, 1.05, and 33.07 percent, respectively, in the skim milk powder.

Soybeans for the table, E. F. Whiteman and E. K. Keyt (*U. S. Dept. Agr. Leaflet 166 (1938), pp. II+6*).—The food value of soybeans and their products is discussed, and typical recipes are given for the use of dry soybeans, soybean milk and curd, and soybean flour.

Determination of optimum conditions for domestic refrigeration of foods, B. E. Proctor and D. G. Greenlie (*Food Res., 3 (1938), No. 1–2, pp. 199–203, figs. 2*).—Uncooked pork chops, lamb chops, hamburg steak, beef liver, haddock fillets, canned peas, boiled, peeled potatoes, heads of lettuce, and bunches of celery were placed in refrigerator dishes and stored for 4 days in six test chambers in a refrigerated insulated room at temperatures between 2.2° and 10° C. and with air velocities of 3, 6, 12, and 24 ft. per minute and relative humidities between 61 and 98 percent.

Satisfactory storage conditions for this combination of foods were obtained when the temperature was 4.4°, the air velocity in the 12 ft. per minute range, and the relative humidity above 92 percent, and when the temperature was 4.4° or below, the air velocity 6 ft. per minute, and the relative humidity 85 percent or higher. The results indicate the desirability of low storage temperatures and high humidity conditions combined with moderate air velocities.

Apparatus for measurements of chewing resistance or tenderness of foodstuffs, N. N. Volodkevich (*Food Res., 3 (1938), No. 1–2, pp. 221–225, figs. 5*).—The apparatus described is designed to reproduce the real chewing resistance of foodstuffs as a means of measuring tenderness and consists of two wedges with points representing the molar teeth. The lower wedge is fitted at both sides with limiting sheets between which the upper wedge moves up and down to prevent the food samples from exuding over the end of the wedges in the squeezing process. The apparatus was tested with strips of boiled beef and veal and with bacon, and the results were checked with measurements made on a pair of squeeze jaws consisting of artificial teeth. The squeeze jaws gave a measure of the resistance of the meat approximately twice as high as was obtained with the wedges and also exhibited a second stage of increased resistance during the latter part of the test period. The author suggests that this second increase in resistance may be due to the adhesion of the meat fibers to the irregular surfaces of the teeth, and if that is so the wedges gave the more accurate measurement of tenderness, particularly in the fibers which were not homogeneous.

The measurement of the efficiency of diets: New apparatus and procedures, E. B. Forbes, R. W. Swift, and A. Black. (Pa. Expt. Sta.). (*Jour. Nutr., 15 (1938), No. 4, pp. 321–349, figs. 4*).—Two experimental procedures are described by which the nutritive values of six different human diets were compared. By one procedure a series of carbon and nitrogen balances was made on growing rats maintained on the same food intake during the entire test and the effect on metabolism caused by the gain in weight of the rats as the nutritional deficiency continued was noted in terms of gross efficiency, covering requirements for maintenance and production together. By the second procedure the carbon and nitrogen balances were compared on fasting rats and on rats fed at the maintenance level and at a higher plane, and values were obtained for heat increment and net energy and separately for maintenance and for growth. In practice, six test chambers are set up so that six animals on the same diet may be tested at the same time. The water-sealed respiration chamber used for the test is described.

The physiological approach to fitness, E. P. Catchcart (*Brit. Med. Jour., No. 4048 (1938), pp. 273–276*).—In this lecture, fitness or more particularly national fitness is defined as "the building up of healthy human beings, well-balanced physically and mentally and emotionally, who will be capable of all necessary adjustments to their immediate environment, be it of work or play." Attention is confined to the physical activity and dietary aspects of the problem. In discussing the latter very briefly, the author cites some of the theories concerning special requirements for physical exercise and muscular activity simply as examples of present day ignorance concerning the chemistry of the body and emphasizes the fact that however important diet may be, it is not the only factor involved in malnutrition.

Insensible loss of weight in infancy: Findings for forty-six infants under basal conditions, J. L. Law (*Amer. Jour. Diseases Children, 55 (1938), No. 5, pp. 966–978, figs. 5*).—Data are reported by the author, with the assistance of W. G. Frederick, for 86 observations made on 46 afebrile infants between 8 days and 10½ mo. of age under the following conditions: Room temperature within 3° of 22° C., relative humidity between 38 and 65 percent, the subject in a quiet relaxed sleep 1½ hr. after a small weighed feeding of milk, sufficient clothes for comfort, and free from visible perspiration.

The insensible loss of weight from day to day remained remarkably constant, and variations of the loss in relation to age, weight, height, and surface area appeared to be within limits of experimental error. On the basis of insensible loss referred to height in centimeters, the rise in the basal rate loss was proportional to the increase in body stature, and the curve obtained is similar to the curve of Benedict and Talbot for the minimum heat production of infants in grams per hour referred to height in centimeters. The curve for the basal insensible perspiration in grams per hour referred to surface area in square meters differs from the curve for the data of Benedict and Talbot on the minimum heat production of infants in calories per hour referred to surface area in square meters. It is concluded that the conditions under which the measurements of heat production are obtained are comparable to the conditions for the determination of basal metabolism, and that the insensible loss in weight may be altered by factors which affect the basal metabolism.

The relation of alanine to growth, J. K. Gunther and W. C. Rose. (Univ. Ill.). (*Jour. Biol. Chem., 123 (1938), No. 1, pp. 39–43, fig. 1*).—In continuation of previous studies (E. S. R., 78, p. 134), data are presented to show that for the rat alanine is dispensable in the ration so far as growth is concerned.

Effect of feeding high levels of copper to albino rats, R. Boyden, V. R. Potter, and C. A. Elvehjem. (Wis. Expt. Sta.). (*Jour. Nutr., 15 (1938), No. 4, pp. 397–402*).—The toxicity of copper in the growing rat was tested by adding copper sulfate in amounts of from 0 to 4,000 p. p. m. to the basal ration No. 351 (E. S. R., 73, p. 370) without cod-liver oil. Food consumption and growth records were kept during the 4-week test period, and the blood, liver, and spleen were analyzed for copper. The rats on the 2,000 p. p. m. level of copper had practically no increment in growth and those on the 4,000 p. p. m. level lost weight rapidly and died. The rats on the 1,000 p. p. m. level had an average growth of 51 g during the test period as compared to 78 and 89 g, respectively, for two groups of rats on the 500-mg level and 86 and 126 g, respectively, for two groups on the ration without added copper. The copper did not begin to exhibit toxic effects until at least 150 times the therapeutic dose, or 500 p. p. m., had been reached. On the higher levels the copper content of the blood and spleen increased to a maximum of 5 times and of the liver to about 300 times. It is concluded that the liver, which is the organ that determines largely the amount of copper to be retained in the body, possesses the ability to take up extremely large amounts of ingested copper without obvious damage.

The effects of small amounts of ethyl alcohol on the respiratory metabolism of human subjects during rest and work, R. C. Grubbs and F. A. Hitchcock. (Ohio State Univ.). (*Jour. Nutr., 15 (1938), No. 3, pp. 229–244*).—Over 50 basal, resting, and work test runs were made on five subjects by the Tissot-Haldane technic following the ingestion of small amounts of ethyl alcohol alone and with dextrose. In the control tests the subjects were given an equal amount of water in place of the alcohol. In the basal tests the alcohol exerted no specific dynamic action 2 hr. after its ingestion, and the ventilation volume and alveolar carbon dioxide remained normal. The respiratory quotient dropped significantly following the ingestion of alcohol in the work tests as compared to the resting tests. The rate of oxidation of the alcohol was highest when the subjects were working on the bicycle ergometer and lowest during the resting periods. When dextrose was given during the resting tests the utilization of alcohol was greater. It is concluded that the muscles are capable of using the energy of ethyl alcohol in the performance of work.

Vitamin A, carotene, and vitamin C content of canned milk, O. Meulemans and J. H. De Haas (*Amer. Jour. Diseases Children, 56 (1938), No. 1, pp. 14–21*).—From three to six samples of each variety of imported canned milk obtainable in the retail trade in Batavia were analyzed for vitamin A, carotene, and vitamin C after dilution for infants about 3 mo. old, as indicated on the label.

With the exception of one preparation of low content, the diluted samples of milk powder, sweetened condensed, evaporated, and sterilized canned milk, and powdered lactic acid milk had combined carotene and vitamin A values lying between those of stall milk and pasteurized milk in Europe, specifically between 10 and 25 μg or 20 and 55 International Units per 100 cc of the diluted milk. Sweetened skim milk contained practically no, and evaporated buttermilk and buttermilk powder very little, vitamin A.

Comparative ascorbic acid figures for human milk, cow's milk, and some of the canned preparations tested after dilution were as follows: Human milk (Batavia)—colostrum about 7 mg and late milk 4 mg per 100 cc; cow's milk—stall (Utrecht) 2.1, pasteurized milk before distribution (Utrecht) 2.1, and after distribution (Batavia) 1.5 mg per 100 cc; canned milk examined at Batavia after dilution—evaporated milk 2–3, sterilized whole milk 1.8, milk powder 0.8–1.6, sweetened condensed milk, sweetened skim milk, evaporated and powdered buttermilk, and lactic acid milk about 1, and evaporated protein milk about 0.5 mg per 100 cc.

It is concluded that "if the bottle-fed infant is to be supplied with the amounts of vitamins A and C that are absorbed by the breast-fed infant, then to all prepared milk, whether fresh or canned, should be added both vitamin A and vitamin C, a prophylactic measure perhaps as necessary as the vitamin D prophylaxis now being generally adopted."

[Report of the] annual meeting of the Council on Foods, F. C. Bing (*Jour. Amer. Med. Assoc., 111 (1938), No. 2, pp. 156, 157*).—In this report one of the topics discussed was the problem relating to the use of conversion factors for changing Sherman units of vitamin A into International Units. It is pointed out that due to the variation in the growth response of experimental animals in different laboratories and in the same laboratory at different times the Sherman unit has no fixed value. In the estimation of the vitamin A content of a food in terms of International or U. S. P. Units, the growth response of animals receiving the test substance is compared with that of animals receiving simultaneously the standard reference material so that the variations in growth due to variations in the composition of the diet and other factors cancel out and the I. U. becomes a relatively fixed value. "In calculations for nutritional purposes, however, it will be necessary for some time to come to convert one unit into another. It is not possible, and because of the nature of the problem it will not be possible, to select a single factor which is entirely satisfactory. It is the consensus of the Council, after reviewing available data, that the most probable relationship is 1 Sherman unit equals from about 0.66 to 0.8 I. U."

Carotene content of fresh, frozen, canned, and dehydrated spinach, D. De Felice and C. R. Fellers. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 728–733*).—The method used is a modification of the Russell method and consists of mixing a sample of ground spinach containing about 0.2 mg of carotene with quartz sand, adding sodium hydroxide and separating four times with petroleum ether, removing the chlorophylls by the addition of methyl alcohol, the xanthophylls by potassium hydroxide in methyl alcohol, and the alkali, water, and any suspended sand by washing with distilled water and with methyl alcohol. The petroleum ether solution is then evaporated to a known volume and compared in a colorimeter having a daylight attachment with a standard or known concentration. The amount of carotene in micrograms per gram is computed from the formula $\frac{ds \times V \times 1000 \times Es}{du \times W}$, where ds is depth of standard solution, du depth of unknown solution, V volume of unknown solution in cubic centimeters, 1,000 is the conversion factor of milligrams into micrograms of carotene, W weight of sample (unknown) in grams, and Es the strength of the standard solution in terms of milligrams of carotene per cubic centimeter of solution. Since the method does not differentiate the β-carotenes from the other carotenes, the vitamin A activity was determined by bio-assay with rats, using the Sherman and Munsell technic (E. S. R., 54, p. 89), and the vitamin A values obtained were compared with the carotene values on a dry basis. The fresh, canned, and frozen spinach contained 90.1, 92, and from 85 to 87 percent moisture, respectively.

Four samples from two lots of fresh spinach contained approximately 430 μg of carotene per gram as compared to 358 for four samples from two lots of frozen spinach, 282 for four samples from two lots of canned spinach, and 309 μg for two samples from one lot of dried spinach. The values obtained by bio-assay averaged for the four samples of fresh spinach approximately 680 International Units, one sample of frozen 576, and three of canned spinach 428 I. U. of vitamin A per gram. The percentage difference between chemical and biological methods varied from 3.2 to 34.9 percent and averaged 12 percent. The ratio of vitamin A in International Units per gram to carotene in micrograms per gram was 1.5, 1.5, 1.6, and 1.7, respectively, for the four samples of fresh spinach, 1.6 for one of frozen, and 1.4, 1.6, and 2.4, respectively, for three samples of canned spinach. Using the conversion factor 1.7, which was the general value obtained for all samples, the following vitamin A values were computed: Fresh spinach 718 I. U., frozen 545, canned 481, and dried spinach 495 I. U. per gram. After 3 months' storage no appreciable loss in vitamin A occurred in the frozen and canned samples.

Carotene and ascorbic acid content of fresh market and commercially frozen fruits and vegetables, G. A. Fitzgerald and C. R. Fellers (Coop. Mass. Expt. Sta.). (*Food. Res., 3 (1938), No. 1-2, pp. 109-120*).—The authors determined the carotene content of 27 fresh and frozen fruits and vegetables, using the De Felice and Fellers method as described in the above paper, and the ascorbic acid content of 7 vegetables in the fresh and frozen states, using the Bessey and King (E. S. R., 71, p. 137) and the Mack and Tressler (E. S. R., 78, p. 154) modifications of the indophenol titration method. Tests were also made on the dehydroascorbic acid content of 3 vegetables and 2 fruits in the frozen state. The frozen products were obtained from the stored packs of six factories and were packed in 1- and 2-lb. wax paper containers.

Calculated on the basis of 0.6 μg of carotene equaling 1 International Unit of vitamin A, the following values are reported for the frozen fruits: Dried prune pulp 2,600 I. U., yellow peaches 2,000, strawberries 740, raspberries (red) 520, Youngberries 460, blueberries 110, grated pineapple 55, apples 36, and cranberries 20 I. U. of vitamin A per 100 g. The values reported for the frozen vegetables are as follows: Spinach 30,000 I. U., pumpkin and squash 18,400, green snap beans 5,400, green peas 4,800, broccoli 4,680, carrots 3,500, sweet corn 2,600, brussels sprouts 2,200, green lima beans 1,800, rhubarb 1,300, wax snap beans 1,240, asparagus 700, cabbage 300, and cauliflower 260 I. U. of vitamin A per 100 g. The values were compared with values for the same fruits and vegetables in the fresh state to show that freezing causes no appreciable loss of vitamin A content when the products are kept in a solidly frozen condition.

The vitamin C losses of fresh vegetables during marketing were 9.6 percent for peas, 20 for asparagus, 25 for snap beans, 35.5 for broccoli, and 7 percent for spinach held for 72 hr. at 21.1° C. Peas and snap beans purchased in the summer contained from 10 to 20 percent more and asparagus, broccoli, and spinach from 25 to 50 percent less vitamin C than when purchased in the winter. Over periods of from 2 to 12 mo. the ascorbic acid content of frozen spinach varied from 0.2 to 0.86 mg per gram as compared to from 0.14 to 0.68 mg for the fresh spinach, frozen green beans from 0.04 to 0.112 and fresh from 0.1 to 0.18 mg, frozen broccoli from 0.57 to 1.24 in the buds and from 1.1 to 1.49 mg in the stems, and fresh from 0.67 to 1.22 mg. frozen asparagus from 0.09 to 0.32 and fresh from 0.18 to 0.44 mg, frozen peas from 0.15 to 0.22 and fresh from 0.25 to 0.28 mg, frozen lima beans of the green type from 0.22 to 0.28 and of the green and white type from 0.19 to 0.23 mg, and frozen whole grains of corn from 0.07 to 0.11 and frozen corn on the cob from 0.09 to 0.125 mg as compared to from 0.061 to 0.116 mg of ascorbic acid per gram of fresh market corn.

The ascorbic acid content of 2 samples of frozen brussels sprouts averaged 0.82 mg before reduction and 0.83 mg after reduction. 6 of cauliflower 0.28 and 0.29, 4 of pineapple juice 0.1 and 0.11, 4 of pineapple flesh 0.09 and 0.1, 2 of green beans 0.12 and 0.13, 3 of strawberries from one factory 0.21 and 0.23, and 3 from another factory 0.13 and 0.13 mg of ascorbic acid per gram, respectively. It is concluded that adequately blanched frozen products do not exhibit oxidation to dehydroascorbic acid during low temperature storage.

Vitamin A: Methods of assay and sources in food, H. E. Munsell (*Jour. Amer. Med. Assoc., 111 (1938), No. 3, pp. 245-252*).—The biological methods of assay reviewed are the growth method, which is the official method of the U. S. P., and the vaginal smear, and the chemical methods are the color test with antimony trichloride and the spectrographic or adsorption method. The discussion of food sources of vitamin A is based on a report noted previously (E. S. R., 78, p. 135). The bibliography lists 84 references to the literature.

Vitamin A: Physiology and pathology, O. A. Bessey and S. B. Wolbach (*Jour. Amer. Med. Assoc., 110 (1938), No. 25, pp. 2072–2080, fig. 1*).—The authors review the utilization, absorption, and storage of vitamin A in the body; the relation of vitamin A to cell physiology as evidenced by its function as a component of visual purple; the specific pathologic changes of vitamin A deficiency such as atrophy of the epithelial tissues, reparative proliferation of basal cells and differentiation of the new product into a stratified keratinizing epithelium in the eyes, teeth, respiratory tract, skin, gastrointestinal and genitourinary tracts, and the nervous system; and the nonspecific results of vitamin A deficiency such as inability of the body to store fat, the appearance of hemosiderosis, cessation of bone growth, and lymphoid hypoplasia of the spleen, and the repair in recovery from vitamin A deficiency. The bibliography lists 102 literature references.

The pharmacology and therapeutics of vitamin A, S. W. Clausen (*Jour. Amer. Med. Assoc., 111 (1938), No. 2, pp. 144–154*).—The author reviews the results of treatment with vitamin A in conditions due to deficiencies of the vitamin in the diet, such as nutritional night blindness, xerophthalmia, keratomalacia, and one type of follicular keratosis of the skin, and in conditions obviously not due to vitamin A deficiency, such as hyperthyroidism, urinary lithiasis, menstrual disorders, senile vaginitis, nutritional anemia, nerve degeneration, and infections. The contradictory nature of the literature dealing with the injurious effects of hypervitaminosis A is noted. The bibliography lists about 230 references.

Vitamin A requirements and practical recommendations for vitamin A intake, L. E. Booher. (U. S. D. A.). (*Jour. Amer. Med. Assoc., 110 (1938), No. 23, pp. 1920–1925*).—The author reviews the factors affecting vitamin A requirements. the prevention of night blindness, and the analysis of dietary surveys in terms of vitamin A intake. Allowing for a fair margin of safety and for the maintenance of a moderate storage of vitamin A in the body, the recommended allowance for the adult is 3,000 International Units, the pregnant and nursing woman 5,000 or more, and the growing child 6,000–8,000 I. U. of vitamin A. The bibliography lists 33 references to the literature.

Effect of vitamin A deficiency upon rate of pupil dilation during dark adaptation, I. H. Wagman and J. E. Gullberg. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 5, pp. 613–615*).—The rate of pupil dilation during dark adaptation was measured in nine vitamin A-deficient rabbits. The method consisted of constriction of the pupil by an intense stimulus light, followed by the taking of a series of photographs in the dark by means of an infra red source of light. The rabbits were maintained on a diet consisting of rolled oats 60 parts, dried skim milk 30, and dried brewers' yeast 10 parts, supplemented by viosterol for a 92-day period. After about 80 days the animals showed definite vitamin A deficiency and were given pure carotene daily for 5 days, when the symptoms disappeared, as judged by the measurement of the rate of pupil dilation. The authors suggest that with the intense, broad beam of light used as the stimulus for pupillary constriction in these tests, the cones alone must be responsible for the pupillary reflex. The effect of the rods on the pupillary action is not detectable by the method described.

Studies on the vitamin B complex, H. W. Schultz and H. A. Mattill (*Jour. Biol. Chem., 122 (1937), No. 1, pp. 183–198, fig. 1*).—The results of a series of experiments are reported to show that at least four water-soluble vitamins, vitamin B_1, riboflavine, Factor 1, and Factor 2, are required by the rat. Evidence is presented to show that Factor 1 is apparently vitamin B_6 as described by György (E. S. R., 75, p. 282) and Factor 2 is probably the precipitate factor of Elvehjem et al. (E. S. R., 78, p. 285) and also contains the filtrate factor described by Elvehjem and Koehn, Jr. (E. S. R., 74, p. 885). The basal diet consisted of commercial casein extracted for 4 days with hot 95-percent alcohol 18 percent, cystine 0.4, sucrose 55.1, Hawk and Oser salts 4.5, fat 20, and cod-liver oil 2 percent. With the exception of vitamin B_1, the crude casein contained some of all of the factors required by the rat for growth and well-being. The biological value of the commercial casein was not lowered by alcoholic extraction, by heating at 120° [C.] for 2 hr., or by alcoholic extraction plus heat. Casein prepared from milk by isoelectric precipitation and purified by 14-day extraction with acidulated water or 7-day with alcohol and with ether had approximately the same biological value as the commercial casein.

The relation between vitamin B_6 and the unsaturated fatty acid factor, T. W. Birch (*Jour. Biol. Chem., 124 (1938), No. 3, pp. 775–793, figs. 9*).—In a series of experiments the author investigated the influence of vitamin B_6 on the production of fatty acid deficiency, as described by Burr et al. (E. S. R., 68, p. 412), and the influence of fat in vitamin B_6-free diets on the development of the acrodynia-like dermatitis. The vitamin B_6 concentrate prepared from dried brewers' yeast extract was tested on rats receiving the basal diet No. 8 described by György (E. S. R., 75, p. 282), with sucrose substituted for rice starch and supplemented by 3 International Units of thiamine and 10 μg of lactoflavine per day. The acrodynia-like dermatitis was cured by 0.2 cc of the yeast extract.

The results indicate that the production and cure of the acrodynia-like dermatitis of rats depends upon the presence in the diet of the water-soluble vitamin B_6 and the fat-soluble factor which is contained in the fatty acid fraction of corn oil and is similar to the fatty acid factor described by Burr et al. and to the fat-soluble antidermatitis factor described by Richardson and Hogan (E. S. R., 75, p. 886). It is concluded that in the absence of vitamin B_6 the rat is unable to utilize efficiently the unsaturated fatty acids and vice versa.

The vitamin B complex and functional chronic gastro-intestinal malfunction: A study of 227 cases, H. Borsook, P. Dougherty, A. A. Gould, and E. D. Kremers (*Amer. Jour. Digest. Diseases, 5 (1938), No. 4, pp. 246–251*).—Approximately 25 percent of a group of 67 patients with chronic gastrointestinal malfunction were relieved of most of their symptoms when placed on a well-balanced low carbohydrate diet and with the use of laxatives prohibited. The addition of about 500–1,000 International Units of vitamin B_1 and 300 of vitamin B complex from a cereal source improved the condition in about 60 percent of a group of 21 patients who failed to improve on the unsupplemented diet regime, and about 1,000 units of vitamin B_1, 250 of B_2, and large amounts of B_6 and the antipellagra factor in a liquid concentrate from rice polishings brought about improvement in about 70 percent of a group of 28. In 5 out of 8 patients who did not respond to the cereal supplemented diet the liquid concentrate was effective. No significant benefits resulted in 12 of the 67 cases. When the vitamin supplements were withheld from 8 patients who had remained free of symptoms for 3 mo., the original symptoms returned within 3 mo. and disappeared again upon the resumption of the supplemented diet. Substitution of part of the vitamin B complex by additional vitamin B_1 in wheat germ brought about the recurrence of the symptoms in 5 cases after 4 weeks.

In another group of 160 patients the addition of the cereal supplement relieved the constipation in from 2 to 4 weeks and the abdominal pain, headaches, and feeling of fatigue disappeared in about 95 percent of the cases, but only 60 percent were relieved of gas pains. Two out of 3 patients with chronic diarrhea were also benefited.

The data are based on daily records kept by each patient during periods varying from 3 mo. to 4 yr., accompanied by medical examination when indicated by a change in the condition of the patient. The findings suggest that several times the minimum amounts of the B vitamins necessary to prevent deficiency diseases are required for normal gastrointestinal function, and that the whole vitamin B complex is superior therapeutically to any single fraction.

Adult scurvy associated with vitamin-B_1 deficiency, J. B. Young (*Lancet [London]*, *1938, I, No. 25, pp. 1385–1387*).—A case history of a male adult with cardiac failure, accompanied by gross edema, hemorrhage of the lower extremities, and severe anemia, is presented. For a period of 2 yr. his diet had been devoid of fresh fruits and green vegetables and for 6 mo. before admission to the hospital had consisted largely of coffee and tea, canned pears and beans, cooked cheese, butter, and breadstuffs. A dietary regime which included fresh fruits, green vegetables, cereals, eggs, liver, and meat, with three large servings of orange juice daily and supplements of marmite, Bemax, malt extract, cod-liver oil, iron, and copper salts brought about immediate improvement and rapid recovery.

The vitamin C content of certified milk at the time of consumption, F. V. West and J. C. Wenger (*Amer. Jour. Digest. Diseases, 5 (1938), No. 4, pp. 251, 252, fig. 1*).—Certified milk was tested for ascorbic acid 10, 34, and 58 hr. after milking. The samples were taken without refrigeration from the dairy farm to the laboratory 20 miles distant, kept at room temperature for 2 hr., and then held at 43° F. until tested. A total of 720 titrations was made on milk from 108 Guernsey and Holstein cows.

The 10-hr. samples had an average ascorbic acid content of 346 International Units per quart for the Guernsey and 312 for the Holstein milk. At 34 hr. the corresponding values were 284 and 262 units and at 58 hr. 244 and 232 units per quart, respectively. The value at 34 hr. is considered to represent the average minimum content of the particular milks tested at the maximum age of consumption. The authors conclude that the milk tested may be said to be a valuable food for its vitamin C content provided 1 qt. is consumed daily, and consequently may be considered "as a highly desirable safety valve in cases where the infant or child has been deprived of citrus fruits or their juices. No attempt, however, should be made by milk producers to discourage the use of orange or lemon juice."

Vitamin C content of vegetables.—VIII, Frozen peas, R. R. Jenkins, D. K. Tressler, and G. A. Fitzgerald. (Coop. N. Y. State Expt. Sta.). (*Food Res., 3 (1938), No. 1–2, pp. 133–140, fig. 1*).—This paper in the series noted previously (E. S. R., 78, p. 892) gives the results of determinations by the Mack and Tressler modification (E. S. R., 78, p. 154) of the indophenol titration method on the ascorbic acid content of two varieties of peas.

In freshly vined peas of the Alderman Telephone variety the ascorbic acid content, determined on the fresh basis, was 0.23 mg per gram before and after the washing process, 0.21 after blanching, 0.22 before the application of the shaker spray, 0.21 before and 0.18 after the quality separator, and 0.16 mg before and after the picking belt treatment, before filling the packages, and after packaging. This represents a total loss of about 30 percent in the ascorbic acid content during the entire process.

When the vines containing Thomas Laxton variety peas were held for 18 hr. at from 17° to 24° C. the ascorbic acid content decreased from 0.25 mg to 0.24

and when peas were held in a control chamber for 20, 21, and 18 hr. at 6°, 21°, and 32°, respectively, the ascorbic acid contents of the three samples were 0.24, 0.25, and 0.22 mg per gram, respectively. In vined peas held for 3 and for 9½ hr. at 4°, the ascorbic acid content decreased from 0.28 mg to 0.26 and when held for 3 hr. at 27° decreased to 0.24 mg per gram. When the blanching time was 60 sec., with the water at 93°, followed by a quick cooling in water at 21°, the test for catalase was negative and the ascorbic acid content of the peas decreased from 0.25 mg to 0.21 mg as compared to 0.2 mg after 85 sec., 0.17 after 128 sec., and 0.16 mg per gram after 153 sec. of blanching. The blanched peas held in the packages before freezing at a temperature of —1° for as long as 10 hr. showed no change in ascorbic acid content. After 5 months' storage at —18°, the frozen peas which had been blanched for 60 sec. in water at 93° had conserved the greatest amount of vitamin C and contained 0.16 mg per gram. Peas thawed at room temperature for 24 hr. in sealed moisture-proof packages had no appreciable loss in vitamin C.

Carbon dioxide storage.—XI, The effect of carbon dioxide on the ascorbic acid (vitamin C) content of some fruits and vegetables, N. C. THORNTON (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 200, 201*).—In this paper, which is one of a series (E. S. R., 79, p. 138), the author reports that green or partially ripened bananas lost from 10 to 20 percent of the ascorbic acid content when exposed to a storage atmosphere containing from 2 to 5 percent carbon dioxide accumulated from respiration at 19° C. as compared to from 66 to 86 percent loss in 60 percent carbon dioxide. The ascorbic acid content returned to a level about equal to that of untreated fruit on removal from carbon dioxide to the air. When stored in 30 percent or more of carbon dioxide the rate of respiration and the H-ion concentration of the banana were markedly reduced. Similarly, fresh asparagus of the Mary Washington variety lost from 50 to 60 percent of the ascorbic acid content, with a reduction in the rate of respiration and the H-ion concentration when exposed to carbon dioxide at any temperature. When removed to an atmosphere relatively free from carbon dioxide the ascorbic acid content of the asparagus continued to decrease. Potato tubers of the Green Mountain variety lost from 16 to 40 percent of the ascorbic acid content upon exposure to from 30 to 60 percent carbon dioxide at 25°, accompanied by an increase in rate of respiration and a decrease in H-ion concentration.

Preliminary tests with garden peas (Burpee Best Extra Early) indicate that in the presence of from 30 to 60 percent carbon dioxide the ascorbic acid content may be reduced 10 percent, while Tendergreen string beans showed no apparent effect during from 24 to 48 hr. of the treatment. Northern Spy, Baldwin, and Russet apples when exposed to carbon dioxide for as long as 10 days at various temperatures showed no appreciable change in ascorbic acid content.

Vitamin C and the cost of food, E. W. HAGER. (Mass. State Col.). (*Jour. Amer. Dietet. Assoc., 14 (1938), No. 5, pp. 354–356*).—A study of the urinary excretion of ascorbic acid for 2 days in each of 7 weekly periods on diets at different expenditure levels by seven college women students living in a home management house is reported in averages for each student and for six of the seven subjects in each period. During the first 3 weeks daily food costs averaged 70, 35, and 50 ct. per person, respectively. The next determinations were made immediately after the Christmas holidays and then followed 3 more weeks at food costs of 50, 70, and 30 ct. per person, respectively.

The average excretion values for the six subjects were 19.2, 12.7, 13.9, 26.8, 21.1, 51.4, and 24.1 mg for the seven periods, respectively. Of particular interest are thought to be the higher values at each cost level in the second period than the first and the higher value on the 30 ct. diet in the second period than on the 70 ct. diet in the first. These differences are thought to reflect aroused interest in the selection of foods for their vitamin C value and to demonstrate the possibility of providing a generous allowance of vitamin C even at a low level of expenditure.

Lack of vitamin C in the diet and its effect on the jaw bones of guinea pigs, M. T. HARMAN, M. M. KRAMER, and H. D. KIRGIS. (Kans. Expt. Sta.). (*Jour. Nutr., 15 (1938), No. 3, pp. 277–284, figs. 2*).—Guinea pigs maintained on the Sherman vitamin C-free diet (E. S. R., 46, p. 865) unsupplemented for 28 days exhibited typical dark circular areas on the exterior surface of the mandible at the bases of the cheek teeth. The addition of 3 cc of orange juice per 300 g of body weight gave almost complete protection. The addition of greens ad libitum to the basal ration resulted in the development of firm, strong jaw bones. Mother pigs maintained on the Ibsen diet composed of alfalfa hay, greens, and a rolled oats mixture had firm, strong jaw bones, and all but 2 of their 27 embryos had been protected from the resorption of the jaw bone.

The chemistry of vitamin D, C. E. BILLS (*Jour. Amer. Med. Assoc., 110 (1938), No. 26, pp. 2150–2155*).—The vitamin D properties of 10 different sterol derivatives are reviewed. Of the 5 for which chemical structures have been established, the 2 most important in medicine are activated ergosterol, which is separated from the byproducts of irradiation and crystallized to become vitamin D in the pure form or is dissolved in an oil to become viosterol in oil, and activated 7-dehydrocholesterol, which appears to be the principal activatable sterol or provitamin in cholesterol. A bibliography lists 32 references.

The determination and sources of vitamin D, E. M. NELSON (*Jour. Amer. Med. Assoc., 111 (1938), No. 6, pp. 528–530*).—In this review paper the author discusses the U. S. P. method for comparing the vitamin D content of a test oil with the U. S. P. reference cod-liver oil by the line test procedure and the modifications necessary when the method is used for determination on other products containing vitamin D or fortified by the vitamin. In place of the line test the percentage of ash in the fat-free leg bones of the rat may be used as a criterion in vitamin D assays. In addition to the few food sources of the vitamin and the use of vitamin D milk, the pharmaceutical preparations which contain vitamin D are noted. The bibliography contains 11 references.

Assay of a vitamin K preparation for vitamin D, H. S. WIGODSKY and A. C. IVY (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 5, pp. 785, 786*).—A sample of vitamin K was assayed for vitamin D by the U. S. P. XI biological test procedure. The administration of 5 mg of the vitamin K concentrate in 0.1 cc of peanut oil daily for 8 days failed to heal the rachitic lesions in the test rats.

The relative effects of certain saccharides and of vitamin D on mineral metabolism of rats, J. OUTHOUSE, J. SMITH, and I. TWOMEY. (Univ. Ill.). (*Jour. Nutr., 15 (1938), No. 3, pp. 257–268, figs. 3*).—Following the control feeding technic described in a previous investigation (E. S. R., 79, p. 420), the authors report that the rats maintained on the lactose ration had greater retentions of calcium, phosphorus, and magnesium than did those on the starch and sucrose rations. With the exception of magnesium, the rats receiving the cod-liver oil ration had retentions equal to those of the lactose-fed rats. The greater retentions obtained on the lactose and cod-liver oil rations are attributed to the decreased excretion of the minerals by way of the gut. No correlation was demonstrated between bone ash values and the retentions of calcium, phosphorus, and magnesium when the data for the rats on any one ration were analyzed, but for the control group, within which variations due to food intake and litter differences were eliminated, a definite relationship was demonstrated for calcium and for phosphorus. It is concluded that the calcification induced by vitamin D was the result of a stimulation to the storage of both calcium and phosphorus, whereas the calcification induced by the ingestion of lactose was due primarily to calcium.

On the nature of the toxic action of vitamin D, C. I. REED. (Univ. Ill.). (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 5, pp. 791, 792*).—The administration to dogs of from 4,000 to 12,000 International Units of vitamin D in the form of decomposed irradiated and overirradiated ergosterol and calciferol produced definite evidence of intoxication within 15 days in 27 of the 30 test dogs. Fourteen control animals received 20,000 I. U. of vitamin D in the form of viosterol and failed to exhibit any toxic symptoms.

Vitamin E, H. A. MATTILL (*Jour. Amer. Med. Assoc., 110 (1938), No. 22, pp. 1831–1837*).—After reviewing the chemistry, physiology, and pathology of vitamin E, the author points out that more clinical evidence is needed to establish the usefulness of vitamin E therapy in abnormal human reproduction. The bibliography lists about 140 references to the literature.

Failure of nicotinic acid in the treatment of anemia, O. C. HANSEN-PRUSS (*New England Jour. Med., 218 (1938), No. 25, pp. 1050–1053, figs. 3*).—Three patients with pernicious anemia, one with hyperchromic anemia and liver disease, one with idiopathic hypochromic anemia, and two with myeloid leukemia were given intramuscular or intravenous injections of nicotinic acid in 60-mg daily doses. There was no evidence of hematologic change other than a drop in the bone-marrow white-cell count, indicating a temporary depression of myeloid function.

Beriberi in alcohol addicts, N. JOLLIFFE and R. GOODHART (*Jour. Amer. Med. Assoc., 111 (1938), No. 5, pp. 380–384*).—In continuation of a previous investigation (E. S. R., 79, p. 280), the authors present the case histories of four alcohol addicts with cardiovascular dysfunction, accompanied by beriberi and in one case by pellagra. The administration by mouth to three of the patients of vitamin B_1 in the form of thiamine chloride and of Vegex in amounts equivalent to approximately 4, 5, and 40 times the patients' predicted requirements, as judged by Cowgill's formula (E. S. R., 79, p. 279), markedly improved or cured the beriberi. The fourth patient was given 20 mg of thiamine chloride daily by intravenous injection and showed definite improvement in the beriberi condition until his death 3 days later.

Treatment of blacktongue with cozymase, F. S. DAFT, H. F. FRASER, W. H. SEBRELL, and M. PITTMAN (*Science, 88 (1938), No. 2275, pp. 128, 129*).—In a brief note the authors report that no therapeutic effect resulted from the intravenous injection of 50 mg of a partially purified preparation of diphosphopyridine nucleotide to two dogs in an acute attack of blacktongue.

Progress in diabetes mellitus, H. F. ROOT and A. MARBLE (*New England Jour. Med., 218 (1938), No. 22, pp. 918–933*).—This is a summary of the literature appearing since the review in the sixth edition of Joslin's Treatment of Diabetes Mellitus (E. S. R., 78, p. 733). Over 100 references are given.

The excretion of porphyrin in pellagra, K. DOBRINER, W. H. STRAIN, and S. A. LOCALIO (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 5, pp. 748–752, fig. 1*).—The excretion of coproporphyrin by a woman who was a chronic alcoholic with symptoms of pellagra was determined. The subject was given 75 g of a yeast extract daily by mouth and 10 cc of a liver extract by intramuscular injection for 10 days, after which the liver was discontinued and the yeast extract was decreased to 50 g daily. During a 6-day control period the fecal and urinary coproporphyrin excretion averaged 897 mg per day, in the first 9 days of therapy the excretion dropped to 458 mg, and in two remission periods of 9 and 6 days the excretion dropped to 381 and 298 mg, respectively. Large amounts of protoporphyrin and deuteroporphyrin were also found in the feces.

Clinical aspects of ultraviolet therapy, E. M. Luce-Clausen (*Jour. Amer. Med. Assoc., 111* (*1938*), *No. 4, pp. 311–316*).—The influence of ultraviolet radiation in rickets is discussed from the physiological and clinical points of view, and the use of heliotherapy and irradiation from artificial sources in rickets and of ultraviolet therapy in tetany, in healing of fractured bone, in some skin diseases, and in tuberculosis is reviewed. Since the effects on the skin of radiation therapy are not completely understood, it is recommended that the treatment should remain within the physiologic limit of tolerance. The bibliography lists 44 literature references.

TEXTILES AND CLOTHING

Measuring the diameter of the cotton fiber, J. H. Moore. (N. C. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30* (*1938*), *No. 7, pp. 604–609, fig. 1*).—The diameters of uncollapsed and mercerized fibers were measured in seven strains of American upland cotton. The correlation of uncollapsed with mercerized diameter amounted to 0.95. The ratio of mercerized to uncollapsed diameter in the seven cottons ranged from 0.623 to 0.665, averaging 0.643. Methods are described for measuring the uncollapsed and mercerized fiber diameter. The gelatin method of sectioning cotton fibers is described, and transverse sections of uncollapsed, normal collapsed, and mercerized fibers are shown.

Clothing investigations [by the Utah Station] (*Utah Sta. Bul. 282* (*1938*), *pp. 89, 90*).—Included in the historical sketch of the home economics research program of the station, other phases of which are noted on page 418, is a summary of a previously reported investigation (E. S. R., 60, p. 497) of the degree to which ultraviolet rays penetrate various clothing materials.

HOME MANAGEMENT AND EQUIPMENT

The Willamette Valley farm kitchen, M. Wilson (*Oregon Sta. Bul. 356* (*1938*), *pp. 82, figs. 29*).—The study described in this bulletin deals with the equipment, arrangement, and minimum dimensions of kitchens that make adequate provision for the needs of Willamette Valley farm families and is a portion of a larger study, a part of which has been noted previously (E. S. R., 78, p. 139). The functions of the kitchen as determined from information obtained in 14 farm homes, the standards for planning the kitchen and the work centers and dining area, and the modifications to allow for either an electric or wood range and the absence of a dining area are discussed in detail. A series of appendixes contains information on the standards for utilizing storage space, the equipment and space allowances used in kitchen planning, the bases for evaluating kitchen arrangements, and supplementary tables showing the kitchen travel estimated for the 10 least area kitchens and for the various proposed arrangements of the work centers and dining area, and the space allotment for the dining area.

MISCELLANEOUS

Pioneering in western agriculture: A résumé of the first half-century of research, 1888–1938, at the Utah Agricultural Experiment Station, including the biennial report, 1936–1938, R. H. Walker (*Utah Sta. Bul. 282* (*1938*), *pp. 160, figs. 55*).—The experimental work reported is for the most part noted elsewhere in this issue.

Publications available from the [Kansas] Agricultural Experiment Station (*Kansas Sta. Circ. 190* (*1938*), *pp. 4*).—The available bulletins and circulars, classified under agricultural economics and agricultural production, are lis

NOTES

Michigan College.—The contract has been awarded for the construction of an addition to the veterinary clinic building which will provide about 26,000 sq. ft. of floor space, including an auditorium seating about 300 persons. This addition will nearly triple present accommodations and will cost $133,000.

Missouri Station.—A new horticultural farm of 160 acres located 6 miles from the main buildings of the station has been purchased and will be used for both experimental and teaching work. Plans are being made to set out on this ground practically every variety of fruit adaptable to the region.

Pennsylvania College and Station.—Dr. R. L. Watts, dean and director since 1912, retired on January 1 to become dean emeritus. Among other interests he will continue to assist in the program of the Cooperative Wildlife Research Unit, which is sponsored jointly by the college, the Pennsylvania Game Commission, and the U. S. D. A. Bureau of Biological Survey. Dr. S. W. Fletcher has been designated acting dean and director.

Wisconsin Station.—Work is under way on a new and final wing to the biochemistry building. This wing will be used for nutrition research, especially by graduate students, and of its $250,000 estimated cost, 55 percent is being supplied by the Wisconsin Alumni Research Foundation and the remainder by the Public Works Administration. An air-conditioned animal room is planned for the third floor.

American Farm Economic Association.—This association held its twenty-ninth annual meeting in Detroit, December 28–30, 1938. The program included over 65 papers dealing with the problems of farm operation under the Agricultural Adjustment Administration; accomplishments in agricultural economics; land use; research and extension work in farm management, marketing, and prices of farm products; effects of mechanization; public assistance to farmers; land values; presentation of statistics; international trade; farm credit; and other phases of agricultural economics. Officers elected included Dr. I. G. Davis, president, and F. F. Elliott and F. V. Waugh, vice presidents. Dr. Asher Hobson, Madison, Wis., was reelected secretary-treasurer.

International Congresses in Europe in 1939.—It is announced that the Eighteenth International Congress of Agriculture will be held in Dresden from June 6 to 12, 1939, under the auspices of the International Confederation of Agriculture. It will be organized into sections of agrarian policy and farm management; agricultural instruction and propaganda; agricultural cooperative societies; cultivation of plants; viticulture, fruit growing, and the cultivation of special plants; animal production; agricultural industries; rural life and the work of the countryman; and agricultural sciences (including the organization and encouragement of research in the field of agriculture).

The Sixth International Technical and Chemical Congress of Agricultural Industries is scheduled to be held in Budapest from July 10 to 20 under the patronage of the Regent of the Kingdom of Hungary. Three divisions have been arranged—(1) general, scientific, and industrial studies, with sections of biology, analytical methods and apparatus, agronomy, and research in the creation of new agricultural industries; (2) specific industries, including sugar, fermentation, foods, tropical industries, and substitutes; and (3) economic studies, legislation, and international agreements.

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EXPERIMENT STATION RECORD

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COOPERATIVE RESEARCH AND DEMONSTRATION IN THE TENNESSEE VALLEY AREA

Although interstation cooperation is nearly as old as the Hatch Act of 1887, some of the most significant developments in group action have been of comparatively recent origin. Prominent among these is the regional project in the Tennessee River Drainage Basin, instituted in 1934 under a three-way cooperative agreement between the seven land-grant colleges directly concerned, the United States Department of Agriculture, and the Tennessee Valley Authority.

In the belief that a sufficient period of time has now elapsed, since this cooperation was begun, to justify taking account of stock, an appraisal has recently been made of the programs, problems, and results which have developed in these cooperative activities in experimentation and extension. The material has been assembled by a special committee on land-grant college data, consisting of Dean T. P. Cooper of Kentucky, chairman, Dean I. O. Schaub of North Carolina, and Extension Directors J. R. Hutcheson of Virginia, C. E. Brehm of Tennessee, and P. O. Davis of Alabama, and a subcommittee on experiment station data made up of Directors A. W. Drinkard, Jr., of Virginia, M. J. Funchess of Alabama, and C. A. Mooers of Tennessee. The report itself, issued under the date of October 1938, has been prepared by Dr. Carleton R. Ball, executive secretary of the coordinating committee. The discussion which follows is based very largely upon its findings.

The Tennessee Valley Authority was established by an act of Congress approved by President Franklin D. Roosevelt on May 18, 1933. Its title enumerates as among its objectives provision for flood control of the Tennessee River, reforestation and the proper use of marginal lands, and the agricultural and industrial development of the valley. These agricultural requirements, it was soon realized, "would compel the Authority to undertake many activities which not only were of interest to the land-grant colleges but actually lay within some of the fields they were occupying. For these reasons, the question of their relationships to the Authority in these activities became of acute interest."

The land-grant institutions of seven States were actively concerned—Alabama, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, and Virginia. An area of over 26,000,000 acres was involved, spread over 124 counties and varying widely in topography, soils, and climate. The population numbered approximately 2,500,000 persons, of whom nearly 54 percent were on farms. High density of population and low production and income levels characterized much of the area and had led to many economic and sociological problems.

The report makes it clear that the colleges "had developed the best programs for agricultural betterment which their limited resources permitted. They were meeting the new demands for training, research, and extension in agricultural economics, home economics, agricultural engineering, chemical and other utilization of farm products, and land-use classification and erosion control to the best of their several abilities." Nevertheless, "because of the large rural population, relatively low tax revenues, and the long-time accumulation of acute and complex problems in proper land use, erosion prevention, living standards, tenantry, etc., they were greatly handicapped in their efforts to keep up with the new problems of the agricultural depression of 1921 and the general depression of 1930."

When the T. V. A. entered the picture, it recognized that the colleges had definite responsibility for agricultural betterment in their several States and that they possessed many resources for this purpose. "Among these resources were large staffs of highly trained and experienced specialists in administration, teaching, research, and extension; extensive equipment and facilities in the way of buildings, laboratories, libraries, experiment farms, machinery, etc.; large accumulations of experience and information on the difficult problems of the area; and, finally, the confidence and support of the people of their respective States. Duplication of these resources on the part of the Authority was recognized to be not only wholly unnecessary but wasteful of the money of the people. The Authority and the colleges recognized also that any attempt to carry through an agricultural program independently of the established State land-grant colleges would lead almost inevitably to a confusion on the part of the farmers and other citizens of the several States. In the third place, the program could not have been inaugurated as promptly or conducted as effectively at the start by a new agency as by one long established and fully organized."

Under these circumstances the desirability of close cooperation with existing agencies was not only recognized but promptly brought under consideration. Two conferences with representatives of the colleges were held in 1933, which led in 1934 to the appointment of a coordinating committee consisting of Dean Cooper as the representative of the seven land-grant colleges, Director J. C. McAmis of the department of agricultural relations of the T. V. A., and Dr. C. W.

Warburton, Director of Extension Work in the U. S. Department of Agriculture. This committee prepared a memorandum of understanding to serve as a basis for cooperative activities, and this memorandum was ratified by all parties concerned in the winter of 1934–35. Its practical effect was a commencement of relations "so intimate that their agricultural activities have constituted one coordinated and unified program of improvement."

Under the policies which were adopted and adhered to, cooperation developed in two major fields—research and experimentation and education and test demonstration. In the first of these the agricultural experiment station was naturally the agency of the college most frequently concerned. The station work dealt primarily with the evaluation of new phosphatic fertilizers, the survey and classification of soils, studies of water run-off and soil movement, terracing costs, farm management investigations, the processing and marketing of farm products, and the development of new or improved farm equipment.

The T. V. A. enabling act specifically authorized that agency to improve the quality of commercial fertilizers and to reduce their costs. The advice of representatives of the colleges, the Department of Agriculture, and farmers' organizations was sought as to what fertilizer studies were most important, and in accordance with their suggestions major attention was given to developing improved methods of manufacture and more highly concentrated forms of phosphatic fertilizers. A cooperative program was agreed upon by the Authority and the Tennessee Station covering the chemical composition and physical characteristics of the new materials developed and also their compatibility with limestone, dolomite, slags, and similar soil amendments. Agreements were also entered into with the seven valley State stations for tests in greenhouse pots, field cylinders (rims), station and substation plats and fields, and in some cases on controlled outlying fields. Two rapid methods for determining the needs of different soils for phosphates and the availability of new fertilizers to crops have also been studied cooperatively. Nearly fluorine-free dicalcium phosphate is being tested for feeding purposes, as well as the addition of phosphoric acid to silage made from legumes and other plants.

Although soil surveys by the Department and State agencies have been in progress for 35 years, much land in the valley area still awaited examination and classification. Because of the necessity for such information in effective land-use adjustment for water control and soil holding, the Authority advanced funds to speed up the program. Since 1934, 6,508,800 acres, or approximately 45 percent of the area requiring survey, have been mapped and classified, some of it on a special large-scale plan.

Erosion processes and flood damage have been very disastrous in the Tennessee River watershed, but there has been a dearth of authoritative information regarding run-off of precipitation water and the soil erosion resulting. In this field there has been cooperation with the stations in Virginia and Tennessee on pasture areas and other severe slopes and with the Alabama Station, where tilting plats, 15 by 20 ft. in size, have been constructed for use with different types of soil to obtain any slope up to 30° and with provision for artificial rainfall of any desired intensity. Terracing practices and costs have also been studied by the same station since 1935.

Readjustments of land use have brought a number of farm management problems. One of these, dealing with factors affecting the carrying capacity of pastures in beef-cattle production has been taken up by the Virginia Station. Other studies have dealt with the processing and marketing of farm products, including cooperative investigations of curing hay and tobacco and storing sweetpotato, better processing of sorghum sirup, quick freezing and also marketing of fruits and vegetables, rapid methods of processing and spinning flax fiber, and processing of cottonseed. There also are projects in the development of new or better adapted forms of farm machinery and equipment, including refrigerated storage units, some of which have involved the cooperation of engineering experiment stations or departments of engineering, as well as the agricultural experiment stations.

Another important phase of cooperative endeavor has been in education and test demonstrations. Among the main objectives of the land-grant colleges in the area have been the diversification of crops and especially the growing of more grasses and legumes in order to provide for better land use, better conservation of water and control of destructive soil erosion, and more dairy and livestock products for home consumption. The assistance of the T. V. A. has given a great impetus to the program, particularly in its relation to fertilizer testing and water control. These two objectives have been united under cooperative agreements for test demonstrations in applying phosphates and lime to grass and legume crops which hold and improve the soil and conserve water. The demonstrations have been carried on very extensively by both farm unit and area test demonstrations, with nearly 10,000 farms and 2,000,000 acres in the 7 valley States participating in the farm-unit tests and 11,832 farms and 1,564,516 acres within the watershed under the area plan on June 30, 1938.

The report summarizes the results of the various undertakings and indicates in some detail the advantages which have accrued from the cooperative method of attack which has been adopted. Among these advantages are cited the pooling of knowledge, facilities, and personnel, the development of a single coordinated program, the saving of money and time, and the encouragement of democratic processes. Regarding the last of these, it is said, "Cooperation itself is a democratic process. When two or more agencies of the highest levels of Government, namely State and Federal, conduct their enterprises cooperatively, it sets a good example in effective citizenship. . . . When the cooperative activities enlist the active and continued participation of thousands of farmers, the encouragement given to more democratic processes is immensely increased. This is true in the most extensive cooperative activities of the land-grant colleges and the T. V. A. in the Tennessee River watershed. The ultimate effects on good citizenship may be far reaching."

As its final conclusion, the report announces its belief that "from the experience obtained in carrying forward this cooperative enterprise, a new pattern of coordinated operation is being formulated. This new pattern should enable these agencies, as they further develop their cooperative relationships, to speed up desirable action programs, to economize in the use of public moneys, and to give greater service to the citizens of the area." This in itself will surely be an outstanding achievement. It may also be added that its benefits will not be restricted to the Tennessee Valley area, but that its success will be of much value as a practical example to research and extension agencies in general.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Library guide for the chemist, B. A. Soule (*New York and London: McGraw-Hill Book Co., 1938, pp. XIII+302, figs 4*).— This book is intended mainly as a guide to the use of keys and summaries. "In this respect it is unlike the few other books dealing with chemical literature because they are mainly concerned with the cataloging of source materials." The author begins with the arrangement of a library and its directories, emphasizing the problems of the chemist rather than those of the librarian. The second section deals with sources of bibliographical data, and is followed by a discussion of periodicals and original reports. Abstract journals and author and subject indexes are next taken up, then reviews, annual reports, encyclopedias, and dictionaries. Textbooks are dealt with in the groups inorganic, organic, analytical, and physical. Patents and Government publications in general are also considered, and the final section treats of report writing and note filing. The book has a combined subject, title, and author index.

Chemical kinetics, F. Daniels (*Ithaca, N. Y.: Cornell Univ. Press; London: Oxford Univ. Press, 1938, pp. VIII+273, figs. 41*).—"This book is based on lectures delivered at Cornell University under the George Fisher Baker Nonresident Lectureship in Chemistry from February to June 1935. So rapidly is our understanding of chemical kinetics changing that it has been necessary to include additional material up to the time of the completion of the manuscript in 1937." The contents are: Introduction, general principles, theories of unimolecular reactions, gas phase reactions, chemical kinetics of reactions in solution, photochemistry, electrical activation, infrared spectroscopy, theoretical calculation of activation energies, and isotopic tracers.

Second International Congress for Microbiology, London, 25 July–1 August, 1936, Report of Proceedings, edited by R. St. John-Brooks (*London: Harrison & Sons, 1937, pp. XIII+579, [pls. 2, figs. 2]*).—Abstracts of papers from numerous institutions, including experiment stations of the United States, make up the greater part of this volume.

Spectrochemical abstracts, 1933–1937, F. Twyman (*London: Adam Hilger, 1938, pp. 52*).—The author here abstracts somewhat more than 200 papers on spectrochemical analysis.

The chemistry of the amino acids and proteins, edited by C. L. A. Schmidt (*Springfield, Ill.: Charles C. Thomas, [1938], pp. XXIV+1031, figs. [252]*).—This book is a compilation with contents as follows: Historical, C. L. A. Schmidt (pp. 3–20); The Constitution and Synthesis of the Amino Acids, M. S. Dunn (pp. 21–122); The Isolation of the Amino Acids From Proteins, H. O. Calvery (pp. 123–163); The Preparation of Amino Acids and Proteins, C. L. A. Schmidt (pp. 164–182); Methods of Analysis and Reactions of the Amino Acids and Proteins, H. O. Calvery (pp. 183–220); The Relation of the Amino Acids to Products of Biochemical Importance, C. L. A. Schmidt (pp. 221–251): Peptides, Peptidases, and Diketopiperazines, J. P. Greenstein (pp. 252–277); The Chemical Constitution of the Proteins, R. J. Block (pp. 278–333);

Molecular Weights of the Proteins, D. M. Greenberg (pp. 334–404); The Coagulation of Proteins, M. L. Anson (pp. 407–428); Surface Tension and Films, E. Gorter (pp. 428–445); Elasticity of Proteins (pp. 445–450) and Cohesion of Proteins (p. 450), both by A. A. Van der Dussen and L. Maaskant; Viscosity of Protein Solutions (pp. 451–461), The Properties, Structure, and Swelling (Imbibition) of Protein Gels (pp. 462–477), and Hydration (Bound Water) of Proteins in Solution (pp. 478–486), all by D. M. Greenberg; Properties of Crystals (pp. 487–520), Magnetic and Diamagnetic Properties (pp. 520–522), Thixotropy (pp. 522, 523), and Melting and Decomposition Points of Amino Acids (pp. 523–527), all by C. L. A. Schmidt; Anisotropy, J. T. Edsall (pp. 527–539); The Hofmeister Ionic Series (pp. 539–542), Antagonism of Ions (pp. 543–546), and Liesegang Rings (pp. 546–551), all by C. L. A. Schmidt; Optical Properties of Amino Acids and Proteins, D. M. Greenberg (pp. 552–595); Amphoteric Properties of Amino Acids and Proteins, D. I. Hitchcock (pp. 596–632); Electrochemistry of Amino Acids and Proteins and Combination of Amino Acids and Proteins With Acids, Bases, Heavy Metals, and Other Compounds, both by C. L. A. Schmidt (pp. 633–719, 720–778); Membrane Equilibria, D. M. Greenberg (pp. 779–821); Some Thermodynamical Considerations of Amino Acids, Peptides, and Related Substances, H. Borsook and H. M. Huffman (pp. 822–870); Dipolar Ionic Structure and Solubility of Amino Acids, Peptides, and Proteins, J. T. Edsall (pp. 871–952); Relation of Proteins to Immunity, M. Heidelberger (pp. 953–974); and The Role of Proteins in Nutrition, R. W. Jackson (pp. 975–996).

The colloidal behavior of flour doughs.—II, A study of the effects of varying the flour-water ratio, M. C. Markley and C. H. Bailey. (Minn. Expt. Sta.). (*Cereal Chem., 15 (1938), No. 3, pp. 317–326, figs. 6*).—Continuing an investigation of which an earlier report has been noted (E. S. R., 80, p. 151), the authors find that the water required to bring doughs to definite minimum mobility can be measured by a recording dough mixer. Absorption and viscosity, or mobility, in doughs are similar to flour concentration and viscosity in the more dilute flour-water systems studied by Sharp and Gortner (E. S. R., 51, p. 803) with viscosimetric technic. Absorption and time required to mix a dough are closely related in a curvilinear fashion regardless of the protein content of the individual flours. This line can be straightened by an appropriate mathematical process. Width of the line drawn by the farinograph pen is a function of the mobility of the dough and not of its elasticity.

Researches on the unsaponifiable substances of wheat oil, A. Dangoumau (*Recherches sur l'insaponifiable de l'huile de froment. Bordeaux: Libr. Delmas, 1935, pp. VII+147, pls. 25, figs. [21]*).—Following a general introduction, this monograph takes up the constitution of the wheat seed, the composition of the unsaponifiable matter, carotene and vitamin A in wheat flours, effect of irradiated flours on experimental rickets, investigation of the agent responsible for the effect of irradiated flours on rickets, and a study of the crystallization of the sitosterol.

The nature of the increase in amylase activity of germinating barley, C. H. Hills and C. H. Bailey. (Minn. Expt. Sta.). (*Cereal Chem., 15 (1938), No. 3, pp. 273–281*).—A careful investigation failed to reveal the presence in green malt of any "amylokinase," or amylase activator.

Papain digestion increased the amylase activity of ungerminated barley approximately 100 percent. This increase in β-amylase activity appeared to be due to proteolytic release of β-amylase associated with water-insoluble material. It is concluded that papain digestion is a valid means of determining the total β-amylase activity of barley or barley malt.

Peptone did not affect the β-amylase activity of barley or malt, but did increase the α-amylase activity of a green malt extract and of a solution of purified α-amylase 24 and 29 percent, respectively. The increase in α-amylase activity of green malt by papain extraction was found to be due not to the release of bound amylase as in the instance of β-amylase, but largely to the increase in activity of α-amylase present in solution. The action of peptone in increasing the α-amylase activity of malt extracts is considered not to have been made clear.

The occurrence of phosphoglyceric acid in the bacterial dissimilation of glucose, R. W. Stone and C. H. Werkman. (Iowa State Col.). (*Biochem. Jour., 31 (1937), No. 9, pp. 1516–1523*).—Phosphoglyceric acid has been isolated from the fermentation products of *Propionibacterium arabinosum, P. pentosaceum, Aerobacter indolgenes, Escherichia coli, Lactobacillus pentoaceticus, L. plantarum, Serratia marcescens, Bacillus subtilis, B. mycoides, Azotobacter vinelandii, Streptococcus paracitrovorus,* and *Staphylococcus albus.* It was not in those of *Clostridium butylicum, C. histolyticum,* and *C. sporogenes.*

Aeration of the fermentation mixtures increases the formation of the ester, while storing the cells at 5° [C.] decreases it. Acetylmethylcarbinol is a better hydrogen acceptor for use with the colon-aerogenes bacteria than either pyruvic acid or acetaldehyde. The possible role of phosphoglyceric acid in bacterial glycolysis is discussed.

The isolation of the compound giving yellow corn its characteristic odor, I. B. Johns and W. Oldham. (Iowa Expt. Sta.). (*Cereal Chem., 15 (1938), No. 3, pp. 377–379*).—A volatile compound having the characteristic odor of yellow corn was isolated from yellow corn oil and was found to be a compound with a molecular weight of less than 150 and containing 1 atom of oxygen. The yield was approximately 1 p. p. m. of pressed oil.

Isolation of a hexosemonophosphate from pea leaves, W. Z. Hassid. (Univ. Calif.). (*Plant Physiol., 13 (1938), No. 3, pp. 641–647*).—A hexose monophosphate isolated from pea leaves proved to be a mixture of glucose- and fructose-phosphoric acid esters. The negative rotation of the barium salt of this hexosephosphoric acid seems to indicate that the fructose component is fructose-*l*-phosphate.

It is suggested that phosphorylation of the glucose and fructose components is a necessary step in the synthesis of sucrose in the plant. The occurrence of the unstable furanose form of fructose in the sucrose molecule is explained by assuming that phosphorylation of the fructose and glucose takes place prior to this synthesis.

[Chemical studies with mangoes by the Puerto Rico Station], J. O. Carrero (*Puerto Rico Sta. Rpt. 1937, pp. 109, 110*).—Determinations of ash, proteins, and crude fiber are noted.

Handbook of chemical microscopy, I, E. M. Chamot and C. W. Mason (*New York: John Wiley & Sons; London: Chapman & Hall, 1938, vol. 1, 2. ed., pp. XVI+478, figs. 165*).—In its present edition this volume (E. S. R., 63, p. 7) has been considerably expanded and rewritten in certain sections, such as those dealing with the study of crystals and cryptocrystalline aggregates, fibrous materials, particle size, illumination, photomicrography, and preparation technics; and important references, indicative of the trend of microscopical advances in these fields, up to July 1938, have been added.

Photoelectric spectrophotometry applied to the quantitative analyses of carotenoid and chlorophyll pigments in ternary and quaternary systems, E. S. Miller. (Univ. Minn.). (*Cereal Chem., 15 (1938), No. 3, pp. 310–316, fig. 1*).—The author finds that photoelectric spectrophotometry can be satisfactorily employed to analyze ternary and quaternary mixtures with less than 2 percent error, providing each component is present in sufficient concentration to form more than 10 percent of the total pigment content.

"Unknown ternary mixtures obtained from tomato tissues may be analyzed satisfactorily. By employing two or more wave lengths per sample per component, lycopene, leaf xanthophyll, and β-carotene analyses on duplicate samples agree with an error of only 2 percent. Part of this error is due to the heterogeneous distribution of the pigments in the tomato tissue."

Acid-base indicators, I. M. Kolthoff, trans. by C. Rosenblum (*New York: Macmillan Co., 1937, 4. ed., pp. IX+414, figs. 23*).—This is a translation of a much revised German edition. Its contents are, in part 1 (the dissociation of strong and weak electrolytes), chapters on the reaction (degree of acidity) of acids, bases, and salts, amphoteric substances, the ion activity theory and its application to acid-base equilibria, and the Brönsted definition of acidity and basicity, properties of acids and bases; part 2 (the properties of acid-base indicators), the color change and properties of indicators, the influence of solvents on the properties of indicators, and the theory of indicators; and part 3 (the colorimetric determination of hydrogen-ion concentration), buffer solutions—preparation and properties, the colorimetric determination of hydrogen-ion concentration, sources of error in the colorimetric method, and indicator papers. An appendix provides a compilation of data useful in connection with the text.

The preservation of brine samples for chemical analysis, M. K. Veldhuis. (U. S. D. A. and N. C. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 18 (1938), No. 1, pp. 6, 7*).—The author tested various preservatives, including thymol, phenol, four other phenolic compounds, toluene, chloroform, formaldehyde, and copper sulfate, for use in pickle brines to hold them for subsequent analysis.

The sodium salt of 2,4,5-trichlorophenol was the most satisfactory for brine samples when the amount of reducing sugar as well as the titratable acidity and pH were to be determined, and either this compound or chloroform was satisfactory when the determination of reducing sugar was to be omitted. Several hundred samples have been preserved with the phenolic compound, and there has been no evidence that any of the samples have failed to keep.

Report on hydrogen-ion concentration of soils of arid and semi-arid regions, W. T. McGeorge. (Univ. Ariz.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 2, pp. 246, 247*).—Changes in pH value as determined at various soil: water ratios were observed. The maximum pH value is obtainable by using a ratio of 1:10, but this value does not represent field conditions, and it is recommended that the determination be carried out at field moisture content. A spear-type of glass electrode strong enough to permit its use in soils of low moisture content was found to be of great value for field determinations.

Report on hydrogen-ion concentration of soils of humid regions: A study of the factors that influence the pH value of Coastal Plain soils and methods for determination, J. B. Hester. (Va. Truck Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 2, pp. 247–251*).—The quinhydrone procedure is satisfactory for most Coastal Plain soils, but is subject to drift at high pH values and in the presence of manganese. The colorimetric method has a wide range of adaptability, is accurate, and has a low initial cost, but is not an absolute method. The glass electrode has a wide range of adaptability and is the most accurate method of the three, but its initial cost is high. From the number of samples of soil that the experiment station has been called upon to handle, it is estimated that the demand for the test by the growers in the future will be very great.

Rapid determination of organic carbon in soil, E. M. EMMERT. (Ky. Expt. Sta.). (*Soil Sci., 46 (1938), No. 5, pp. 397–400*).—The color formed by heating the sample with 50 percent sulfuric acid until fuming begins is compared with the color developed by a like treatment of a glucose standard. The recovery of carbon added to the soil as glucose is shown.

Report on phosphoric acid: Citrate-insoluble phosphoric acid in ammoniated mixtures containing dolomite, W. H. ROSS, L. F. RADER, JR., and K. C. BEESON. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 2, pp. 258–268*).—Available results of work not yet completed indicate that the di- and tricalcium phosphates initially formed in the ammoniation of superphosphate undergo hydrolysis in storage at temperatures above normal to form calcium hydroxyphosphate, and that the presence of dolomite increases the extent to which these reactions take place. In the presence of fluorine, the reaction apparently proceeds to the formation of a fluophosphate such as fluorapatite. The proportions of these citrate-insoluble phosphates in an ammoniated superphosphate or a mixture of an ammoniated superphosphate and dolomite depend on the basicity of the mixture, the moisture and fluorine content, the concentration of the reacting components, and the temperature and time of storage.

The meaning of fermentation tolerance, R. J. CLARK. (Kans. State Col.). (*Cereal Chem., 15 (1938), No. 3, pp. 342–344*).—This is a discussion of replies to a questionnaire sent out to cereal chemists, bakers, and bakery engineers, with the purpose of establishing a generally acceptable definition of the term "fermentation tolerance."

An improved and modified Evenson color test for "remade milk", B. W. FAIRBANKS, D. A. MAGRAW, and L. E. COPELAND. (Univ. Ill. et al.). (*Jour. Dairy Sci., 21 (1938), No. 10, pp. 633–636*).—Certain modifications in Evenson's color test for remade milk (E. S. R., 47, p. 111) are described which facilitate the detection of 5 percent remade milk in fluid milk. A new method of washing the protein and the use of a stronger sodium hydroxide solution to improve the color contrast constitute the principal changes.

The limitations and significance of some of the methods of analyzing ice cream, A. C. FAY. (Kans. Expt. Sta.). (*Ice Cream Rev., 19 (1936), No. 9, pp. 44, 46, 96, 98, 100*).—This is a brief description of bacteriological methods, including direct microscopic study, plate counts, etc., with discussion of the interpretation to be placed upon the results.

Interpretation of chemical analyses of preserves and jams, J. W. SALE. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 17 (1938), No. 11, pp. 331–336, 347; also in Canner, 87 (1938), No. 7, pp. 15–20*).—The author outlines the present method used by the U. S. D. A. Food and Drug Administration in calculating the fruit content of market samples of alleged preserves and jams from their analysis and show how it is applied by analytical figures for products of known composition.

Appertizing, or the art of canning: Its history and development, A. W. BITTING (*San Francisco: Trade Pressroom, 1937, pp. 852+V, [figs. 33]*).—The first part of the book consists of a paper by K. G. Bitting on N. Appert and his pioneer experiments in canning, followed by a number of selected papers and patents of historical interest. The second part deals in detail with the canning of various food products and with legal standards for such products.

Blanching vegetables for freezing preservation.—I, Effect of blanching on quality control. II, Inactivation of the enzymes in vegetables, M. A. JOSLYN and G. L. MARSH. (Univ. Calif.). (*Food Indus., 10 (1938), Nos. 7, pp. 379–381, fig. 1; 8, pp. 435, 436, 469*).—The authors discuss in some detail in the two parts of this article steam or hot-water treatment of various vegetables in preparation for freezing preservation. Conditions necessary to the conservation of color, flavor, and odor are pointed out. "At a definite period of scalding there is a critical temperature range below which the formation of off-flavors is not entirely inhibited, and the color is not 'set.' And above this temperature range there is a loss of fresh flavor, formation of cooked flavors and softening of texture. This temperature range is apparently different for each vegetable and increases with the storage period." In general shorter periods of blanching than those originally thought necessary are now recommended. Blanching temperatures up to 185° F. were found insufficient. Material blanched at temperatures over 188° were satisfactory in flavor and color Excessive heating, however, caused softening and other objectionable changes

The second part of the article is concerned mainly with the inactivation of specific enzymes. "The qualitative test for catalase inactivation may occasionally be deceptive in determining the proper blanching period for even peas, and is not applicable to all products. The peroxidase test may be used as an additional index of proper blanching in some cases. Phenolase test, for vegetables and fruits that discolor, is the most definite index of adequate blanching. This is particularly true for artichokes."

Microscopic studies of frozen fruits and vegetables, J. G. WOODROOF (*Georgia Sta. Bul. 201 (1938), pp. 46, figs. 22*).—This bulletin reports histological studies of growing stems, mature fruits, immature seeds, and young leaves, following freezing by both slow and rapid methods.

Ice crystals may be increased as much as 500 times by slowing down the rate of freezing, and the largest ice crystals may range up to 1,000 times the size of the cells of asparagus or spinach. The presence of large ice crystals within tissue results in crushing, rupturing, and distortion of cells, the destructive influences reaching a minimum when ice crystals were produced as small as, and contained within, individual plant cells.

There was a movement of water, within the tissue, toward the point of first ice formation, with the formation of a few large crystals rather than many small ones. This was overcome by very rapid freezing.

"It appears that the nuclear material of living cells is irreversibly precipitated on freezing, liberating a certain amount of free water, while the cytoplasm is coagulated, setting free a relatively large amount of water, the bulk of which reabsorbed on thawing. After being frozen the nuclei are granular while the cytoplasm appears in thickened amorphous masses. Starch grains and calcium oxalate crystals remain virtually unaltered." The firmness of the thawed product as determined by a crushing pressure test, the loss of juice, the size of the ice crystals, and color were found to be correlated and to furnish convenient means for evaluating the freezing methods used.

As practical conclusions from the observations noted, it is stated that "a short interval between the formation of the first ice crystals and complete hardening of the product is essential for the preservation of texture, palatability, and superficial appearance of fruits and vegetables. Heat removal should be sufficiently rapid to cause ice formation to progress in tissue at the rate of 0.3 cm per minute, at which rate a medium size strawberry will freeze in 5 min. and harden in 25 min." It was also indicated that "quick freezing can be accomplished by immersing in a liquid [sirup] at 0° F., provided the solution is agitated and the product is in relatively small pieces. Storing at from 0° to 5° is necessary to keep the product fully hardened."

The capacity of flattened tube juice pasteurizers, J. L. HEID and W. C. SCOTT. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16 (1937)*, *No. 5, pp. 136–139, figs. 3*).—Performance data on straight and coiled tubular juice pasteurizers are given, together with calculations of capacity, juice velocity, thermal efficiency, and heat exchange rate. The heat exchange rate was appreciably higher in the coiled tube.

A bottle sterilizer for small capacity plants, R. E. Marshall. (Mich. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 18 (1938), No. 1, pp. 8, 9, figs. 2*).—The author gives directions for the construction of a U-shaped metal tube through which beverage bottles may be passed for sterilization in a hypochlorite solution. The sterilizing tube, when operated at a capacity of 220 quart bottles per hour, permits 2 bottles to fill with the sterilizing solution and 2 to empty simultaneously, and the length of the tube is such that 2½ min. elapse from the time a bottle is completely filled with chlorine solution until it is fully drained. Observations indicated that the bottles were completely sterilized in this time. Suggestions for the construction of units having greater capacity are given.

Suggestions for standards for fruit beverages, W. V. Cruess. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16 (1937), No. 10, pp. 293–296, 313*).—The minimum ratios of various juices suggested for beverages not reinforced with added color or flavor are orange 20 percent, apple 25, California grape 25, Concord grape 20, berry beverages 20, canned pineapple juice 25, and pomegranate 40–45 percent. Prune juice of 20° Brix with no added sugar was the best of the prune beverages. It should not be sweetened or "stretched" by adding sugar, color, water, etc.

Concentrated apple juice, H. H. Mottern. (U. S. D. A. and Wash. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 17 (1937), No. 3, pp. 68–70*).—On concentration by evaporation the volatile flavor and aroma are lost first, but returning the first distillation fraction after the concentration gave a high recovery of these constituents. Concentration by freezing out a part of the water content of the juice could be carried to the point of removing two-thirds of the original volume, but beyond this point there was an increasing loss of sirup with the removed ice. In a rapid evaporator developed at the fruit and vegetable products laboratory loss of flavoring components was less in proportion to the degree of concentration than in vacuum-pan evaporation, but recovery of distilled-off flavors was less effective than in the vacuum pan.

"A combination of freezing concentration in which the volume of juice is reduced to one-third by freezing, rapid evaporation in which a proportional amount of flavor is retained in the concentrate, and the addition of flavoring ingredients recovered in the process should give a concentrated juice of superior quality, under conditions which can be obtained commercially."

Experiments on the canning of apple juice, D. A. Tucker, G. L. Marsh, and W. V. Cruess. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1935), No. 1, pp. 7, 8*).—The authors report the results of experiments to determine the effect of various factors upon corrosion losses.

Canning of California grape juice, W. V. Cruess and L. Cash. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1936), No. 12, pp. 357, 358, 364, 373*).—Both red and white juices were successfully kept in specially enameled tins at ordinary temperatures, but neither plain tin nor type L plate resisted these juices satisfactorily without the enamel.

The processing of citrus juices: Observations on heating and cooling operations, J. L. Heid and W. C. Scott. (U. S. D. A. and Tex. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 17 (1937), No. 4, pp. 100–104, 121, figs. 3*).—The authors give performance data and heat-exchange calculations for various types and combinations of juice-handling equipment.

Blanch vs. soak in canned prepared dried prunes and juice, E. H. WIEGAND. (Oreg. Expt. Sta.). (*West. Canner and Packer, 30 (1938), No. 8, pp. 20–22, fig. 1*).—A comparative study of commercial processing methods is reported upon.

Changes in composition of olives during processing, W. V. CRUESS, A. EL SAIFI, and E. DEVELTER (*Canner, 87 (1938), No. 14, p. 28*).—The authors found that there was in all cases a moderate increase in oil content, probably due to conversion of oleanol or of mannite to oil During lye treatment in most cases there was a decrease in oil content; a great decrease in water-soluble solids, a marked increase in pH value, a slight decrease in alcohol precipitable matter, and a slight decrease in total protein; and a very marked decrease in total sugars, mannite, tannin, coloring matter, and total acid.

Process for the manufacture of maraschino cherries, E. H. WIEGAND. (Oreg. Expt. Sta.). (*West. Canner and Packer, 28 (1936), No. 8, pp. 5–7, fig. 1; 29 (1937), No. 2, pp. 33, 34, figs. 2*).—The first part of this article points out the importance of correct harvesting stage, while part 2 takes up the remaining steps of the manufacture.

Commercial fig products, W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 17 (1938), Nos. 11, pp. 337–339, 343; 12, pp. 368, 369, 375, 377; 18 (1938), No. 2, pp. 39–42*).—This is a continued article discussing some details of the commercial preparation of products already in use and of some new products.

Utilization of surplus apples, W. V. CRUESS and R. CELMER. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 17 (1938), Nos. 11, pp. 325–328, 345, fig. 1; 12, pp. 356–359, fig. 1; 18 (1938), Nos. 1, pp. 4, 5; 2, pp. 43, 44, 52, 54; 3, pp. 79–81, fig. 1*).—This continued article, of which the several parts appear in five issues, takes up a variety of apple products, including apple juice, apple sauce, apple butter, bottlers' sirup, canned apples, sliced fresh apples, apples in candy, concentrated apple juice, dried apples, etc.

Pectin from apple thinnings, G. L. BAKER and M. W. GOODWIN. (Del. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 18 (1938), No. 2, pp. 36, 37, 59*).—The authors indicate that the expense involved in the utilization of thinnings or drop apples in the preparation of pectin products is small compared with the value of the pectin present. A greater demand for fruit for pectin purposes may also develop as uses for the low-cost pectin products suggested here are found.

Pickle and kraut packers conference, Michigan State College, East Lansing, Michigan, February 24, 25, and 26, 1937, F. W. FABIAN (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16 (1937), Nos. 7, pp. 209, 210, 211, 214, 217; 8, pp. 240, 241, 242, 243*).—The following papers are abstracted: Demonstration of Rapid Soil Testing Methods, by C. H. Spurway; The Role of Salt in the Curing of Cucumbers, by F. W. Fabian; Chemical Changes Occurring in the Curing of Salt Stock, by M. K. Veldhuis (U. S. D. A.); The Influence of Type and Variety of Cucumbers on Bloaters and the Quality of the Finished Product, by R. G. Switzer; The Soil Fertility Factor in Pickle and Cabbage Soils, by C. E. Millar; How to Make Good Sauerkraut, by C. D. Kelley (N. Y. State Expt. Sta.); The Cause and Prevention of Soft Cucumbers, by E. A. Johnson; Some Observations on "Bloaters" or Hollow Cucumbers, by I. D. Jones; Some Important Factors Influencing the Fermentation of Dill Pickles, by F. W. Fabian; A Comparison of Acetic and Lactic Acids for Finishing Pickles and Pickle Products, by C. E. Wadsworth; Bacterial Microflora Occurring During the Curing of Salt Stock, by J. L. Etchells (U. S. D. A.); Factors Influencing the

Quality of Sauerkraut, by C. D. Kelley (N. Y. State); and Microorganisms Found in Spoiled Pickles, Relishes, and Similar Products, by R. G. Switzer.

Enzymes and their relation to pickle spoilage, F. W. Fabian and E. A. Johnson. (Mich. State Col.). (*West. Canner and Packer, 30 (1938), No. 8, p. 49*).—The authors grew *Bacillus mesentericus fuscus* in a special medium which enabled them to obtain a preserved solution of the enzyme which decomposes pectin. The organism causing the spoilage was very sensitive to acids but very tolerant to salt, whereas the enzyme produced by this organism was more readily inactivated by salt than by acids. Added sugar, in the absence of salt, encouraged the growth of the spoilage organism. In a brine, however, "inasmuch as salt checks the growth of pectin decomposers and does not seriously interfere with the growth of acid producers the addition of sugar would give the advantage to the acid producers. The amount of sugar to add should not exceed 1 percent."

Champagne, from vine to market, F. M. Champlin, H. E. Goresline, and D. K. Tressler. (U. S. D. A., N. Y. State Expt. Sta., et al.). (*Wine Rev., 6 (1938), No. 11, pp. 12–14*).—The authors very briefly outline the process as now carried out in the New York State wineries.

Observations of '36 season on volatile acid formation in Muscat fermentations, W. V. Cruess (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16 (1937), No. 7, pp. 198–200, 215, 219, figs. 2*).—Early hot weather during the 1936 season was accompanied by high volatile acid formation, some of the wines produced being fit only for distillation. This high volatile acidity was found to be produced by lactic acid bacteria and to be controllable by as little as 50 p. p. m. of sulfur dioxide. In actual practice, however, because of imperfect mixing, 100 p. p. m. of sulfur dioxide appeared to be a surer control measure.

Notes on producing and keeping wines low in volatile acidity, W. V. Cruess. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1935), No. 3, pp. 76, 77; 4, pp. 108, 109, 119*).—Of the four methods compared, cooling, coupled with the use of metabisulfite and pure yeast, gave the soundest dry wines of the lowest volatile acid and sugar content.

Precipitation rate of cream of tartar from wine, G. L. Marsh and M. A. Joslyn. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1936), No. 5, pp. 134–139, figs. 8*).—The precipitation of cream of tartar from new wines is hastened by cold storage, the rate of precipitation depending on the storage temperature and on the type of wine. The rate is more rapid during freezing storage than in cold storage. The actual quantity of cream of tartar to be removed from wine to effect its stabilization cannot be predicted, since many factors affect the actual solubility of cream of tartar in wine.

Preliminary observations on the mellowing and stabilization of wine, M. A. Joslyn. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1935), No. 1, pp. 10–12, 24*).—Clarification and stabilization by freezing and various forms of rapid aging were studied.

Bacterial diseases of wine with reference to Lactobacillus and mannitic organisms, M. J. Curtis. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16 (1937), No. 6, pp. 174, 175, 182, figs. 4*).—The author describes studies of several organisms producing "tourne" disease or a similar condition in wines. This spoilage could occur in sweet wines of high alcoholic strength (up to 20 percent or more). It was favored by overprolonged contact with the lees. A sound wine which did not spoil in 10 weeks after inoculation did show the characteristic spoilage symptoms after it had been left in contact with added yeast. It was found that good preventive measures are to raise the acidity to 7 parts per thousand tartaric before fermentation, and to rack as soon as fermentation ceases. Removal of much of the nitrogenous substance by fining with tannin and gelatin also aids and helps mature the wine.

Casein and its uses, H. Hadert, trans. by H. Goldsmith (*New York: Chem. Pub. Co. N. Y., Inc., 1938, 2. ed.,* [*rev. and enl.*], *pp.* [*5*]+*103,* [*figs. 17*]).—This is a bound but mimeographed translation of a German handbook on the manufacture of casein and its use in adhesives, paints, plastics, etc.

AGRICULTURAL METEOROLOGY

Textbook of meteorology, edited by R. Süring (*Lehrbuch der Meteorologie. Leipzig: Willibald Keller, 1938, 5. ed., rev., pt. 3, pp. 193–288, figs. 15*).—This is part 3 of the fully revised edition (E. S. R., 78, p. 754).

United States Meteorological Yearbook, 1936 (*U. S. Met. Yearbook 1936, pp. IV+160, figs. 4*).—This yearbook (E. S. R., 77, p. 300) contains a general summary of weather conditions in the United States during the year 1936, and annual meteorological summaries, 1936, which have been previously noted from other sources.

A new simplified air pressure variograph [trans. title], H. Benndorf and W. Zimmermann (*Met. Ztschr.* [*Braunschweig*], *55* (*1938*), *No. 8, pp. 273–283, pl. 1, figs. 8*).—A simple photographically registering air pressure variograph is described, with discussions of procedures, formulas, and applications.

The climates of North America.—II, Canada, A. J. Connor (*Handbuch der Klimatologie,* edited by W. Köppen and R. Geiger, *Band II, Teil J. Berlin: Borntraeger Bros., 1938, vol. 2, pt. J, pp. X+J329–J424, figs. 3*).—This is a part of what is planned to be a five-volume treatise on world climatology (E. S. R., 78, p. 158).

Effects of forests upon local climate, C. R. Hursh and C. A. Connaughton. (U. S. D. A.). (*Jour. Forestry, 36* (*1938*), *No. 9, pp. 864+866*).—An area in Tennessee of 7,000 acres, once heavily forested, has been completely denuded by smelter fumes, surrounding which is a zone of 12,000 acres supporting a stand of perennial grasses. This in turn is surrounded by a hardwood forest of approximately the same composition as that originally occupying the basin. Two years' records in these zones showed that average daily temperatures dropped 3°–4° F. lower in the forest than in the denuded zone and did not generally rise as high. Average wind velocities were 7–10 times as high in the denuded zone in winter and 34–40 times as high in summer, and evaporation was twice as great in winter and 7 times as great in summer. More astonishing, however, in the winter of 1936 precipitation was 17.5 percent greater in the forest than in the denuded zone, and in the preceding winter, 25 percent greater.

Research on snow conditions at several western forest experiment stations has demonstrated that a forest cover both intercepts snowfall and retards its melting, and with regard to rainfall it has become evident that interception by vegetation is a very significant factor in the water cycle. The influence of forests on local climate is said to be no better shown than in shelterbelt plantings in the Prairie-Plains region. These are only examples of the considerable volume of research indicating the effects of forests on local and environal climate to be marked. Though generalizations concerning these effects are difficult, the knowledge being obtained as to the relationship between local forests and local climate is basic to good silviculture, forest protection, and watershed management, each of which is briefly discussed.

Ground cover affects frost penetration, R. J. Barnett. (Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans., 40* (*1937*), *pp. 203–207, figs. 6*).—From the observations here recorded the author states that a lag is shown between a change in air temperature and the response of the frost in the soil, that a blanket of compacted snow or ice does not lessen the frost penetration into the soil as does a layer of loose snow, that the efficacy of a straw mulch in preventing deep freezing of the underlying soil is demonstrated, that under the influence of higher air temperature the thawing of the soil occurs from both the surface and the lower face and continues at nearly the same rate upward and downward, and that, except for the straw mulch site, the surface condition of the soil caused only slight variations in the depth of penetration and the profile of the frozen soil during the winter of 1936–37.

The effect of vegetation upon snow cover and frost penetration during the March 1936 floods, C. H. Diebold. (Cornell Univ.). (*Jour. Forestry, 36 (1938), No. 11, pp. 1131–1137, figs. 2*).—Although the value of forests for flood control has long been debated, relatively few studies of the subject have been made. The 1936 floods occurred while the author was making intensive studies on the effect of vegetation upon snow cover and soil temperature in the 1,880-acre Arnot Forest near Ithaca, N. Y., and the data accumulated indicate that hardwood forests are a favorable influence which should be considered in flood control programs. The acreage of frozen soil and floods was confined principally to bare, exposed fields possessing a scanty snow cover during the winter. The soil was frozen neither at 12 hardwood forest stations nor at 6 stations with herbaceous cover. Hardwood forests, as compared with bare fields and herbaceous cover, greatly reduced the drifting of snow, thus favoring a deep, well-distributed snow cover. Reforestation of areas where the snow cover is irregular and the soils freeze deeply and the protection of forest lands should reduce the acreage of frozen soils and increase the snow retention, thereby reducing the peaks of floods.

Freezing weather in relation to plant distribution in the Sonoran Desert, W. V. Turnage and A. L. Hinckley (*Ecol. Monog., 8 (1938), No. 4, pp. 529–550, figs. 4*).—The temperatures in this area in January 1937 were generally colder than for 24 yr. past, and the reactions of plants afforded evidence as to the role of winter freezing in determining the geographical distribution of many species. The authors summarize the data obtained on this cold wave and its damage to plants, discussing the synoptic aspect of the cold wave; the minimum temperatures in the desert, including ground inversions, another thin inversion layer, duration of freeze as of paramount importance, mountains overlooking the desert, and Yakui River records; and details as to the influence of the cold wave on vegetation in the southern Sonora, Sasabe to Altar and Tiburon Island, Papago Reservation, Tucson and Superior regions, northern part of Sonoran Desert, southern Utah, and Baja California.

Two features are said to stand out above others, viz, (1) the occurrence of frost, and (2) the duration of freezing temperatures throughout the night, the following day and night, and even longer. The southern limit of this first datum coincided roughly with the northern extension of the tropical thorn forest, and the second with the northern limit of the Sonoran Desert and with the vertical limit of desert vegetation on mountain slopes and tablelands. Although the most profound changes in vegetation occurred at these boundaries, there were many species having their distributional limits somewhere between them. The thin layer of cold air near the ground, presumably at most topographic sites on inversion nights, is probably a potent factor in a seedling's struggle for establishment. Various distributional factors other than temperature are also discussed, including moisture and accessory physical conditions.

Rainfall-intensity contrasts in Indiana—causes and consequences, S. S. Visher (*Geog. Rev., 28 (1938), No. 4, pp. 627–637, figs. 18*).—In this account the author discusses the advantages of Indiana for such a study, the aspects of rainfall-intensity studies, intensity contrasts revealed by other maps, causes for the contrasts in rainfall intensity, some apparent effects of the intensity contrasts, and rainfall intensity in relation to crop yields. It is concluded that this study of a sample area indicates significant contrasts in rainfall intensity as existing in a region previously believed to be distinctly uniform climatically. "The correspondence found between the distribution of this fundamental climatic factor and the distribution of various conditions affected by it suggests that similar studies of rainfall-intensity contrasts in other areas might throw light on problems of regional differences."

Agricultural atlas of Sweden, compiled by O. Jonasson, E. Höijer, and T. Björkman (*Stockholm: Lantbr. Tidskr. A.-B., 1938 pp. 176, [figs. 112]*).—The climate of Sweden is discussed with special reference to the relations of temperature and rainfall to agriculture. The temperature (1859–1925) and annual rainfall (1911–20) are presented diagrammatically.

Lowering of the air temperature by precipitation [trans. title], G. A. Suckstorff (*Met. Ztschr. [Braunschweig], 55 (1938), No. 8, pp. 287–292, figs. 7*).—It is shown that in the regions of influence of showers, storms, and cold fronts a cooling effect occurs which depends on three factors, viz, (1) the lowering of temperature by the moist adiabatic throwing down of the air in the region of precipitation, (2) the melting of snow and sleet during their fall, and (3) the cooling of the ground by the colder precipitated elements and by their partial evaporation. In the case of showers and smaller cold fronts the first factor operates most strongly. In storms the cooling effect is reinforced by the second and third factors.

The reciprocal of rainfall and temperature as it affects the apple crop, G. E. Marshall and M. S. Troth. (Ind. Expt. Sta.). (*Ind. Hort. Soc. Trans., 1937, pp. 123–129, figs. 4*).—The authors note that drought years occur more or less regularly in 10-yr. cycles, and refer especially to such a period since 1930. With regard to the apple crop, it is claimed that a drought is seldom of itself destructive to such deep-rooted trees, but that great damage may result if it is accompanied by excessive temperatures, and especially when high wind velocity is a concomitant factor. Charts indicate the rainfall of the last 10 yr. and during the growing season for each of 8 yr. in Indiana. Summarized climatic data are presented to indicate some of the reasons why orchards were so severely damaged in 1936.

A contribution regarding the microclimate of an orchard tree [trans. title], A. Mäde (*Gartenbauwissenschaft, 12 (1938), No. 2, pp. 127–137, figs. 5*).—The author presents observations on the microclimate of different parts of a cherry tree, with special reference to the phenology of the blossoms.

The agricultural and industrial effects of cyclones, J. C. González Maíz (*Asoc. Téc. Azucareros Cuba, Proc. Ann. Conf., 10 (1936), pp. 93–100*).—This paper presents the results of a study of the effects of the cyclone of September 28, 1935, in Cuba, with respect to the most important factors in relation to the growing of sugarcane and to the sugar industry, viz, the time of year when it occurred, the effects on plant and ratoon canes, the care of ratoons and spring cane, and the post-cyclonic rains. Transportation capacity and loading difficulties, the effects on the grinding rate, clarification, pan boiling, and rendment, and damages to the molasses plant and to the sugars are also considered.

The hurricane, D. Wyman (*Arborist's News, 3 (1938), No. 11, pp. [1–4]*).—This is a general summary of the damage done in New England by the hurricane of September 21, 1938, with special reference to trees.

Additional observations on storm damage (*Arborist's News, 3 (1938), No. 11, pp.* [*5–7*]).—This report consists of excerpts from letters regarding the damage to trees in New England and New Jersey regions by the 1938 hurricane.

Hurricane damage to shade trees, E. P. Felt (*Arborist's News, 3 (1938), No. 11, pp.* [*4, 5*]).—This is a general summary of the damage to the shade trees of New England by the 1938 hurricane.

Progress in fire-weather service during the last decade, L. T. Pierce. (U. S. D. A.). (*Jour. Forestry, 36 (1938), No. 9, pp. 916–919*).—A review of the present organized program of forecasts, which is said to be comparatively new.

SOILS—FERTILIZERS

An introduction to the scientific study of the soil, N. M. Comber (*London: Edward Arnold & Co.,* [*1936*], *3. ed., pp. VII+206, figs. 25*).—In preparing the third edition of this book (E. S. R., 68, p. 158) the author has rewritten some parts of the chapters dealing with humus and with colloids and flocculation. A little has been added on the mineralogy of clay, and a paragraph on the randomized block method has been appended to the chapter dealing with field experimentation. Some additions have been made to the treatment of water movement in soils.

[**Soil investigations by the Puerto Rico Station**] (*Puerto Rico Sta. Rpt. 1937, pp. 6–16, 105–109, figs. 11*).—Work on erosion and its control is taken up under the following captions: Erosion has been proceeding rapidly from a geological viewpoint, unprotected hillside cornfields have lost best topsoils by erosion, hillside cultivation of tobacco has been wasteful of fertile topsoils, regional planning could avoid wasteful crops on steep hillsides, annual crops needing frequent tillage have increased erosion on steep hillsides, severe erosion has followed root crops on steep hillsides, broad bench terraces have been used for winter vegetable crops on steep hillsides, high-value crops were necessary to yield return on increased investment in terraced land, as density of population increases greater expenditures are reasonable for productive land, narrow, canalled terraces were constructed more cheaply than broad benches, mangum terraces are less expensive than bench terraces, different methods of planting the areas between mangum terraces have been tried, contour canals lessened erosion in hillside bush and small-tree crops, crop selection for hillside plantings can minimize erosion, and earth dams for flood control have reclaimed land.

The station also reports experiments, by J. O. Carrero, indicating that the applications of sulfur needed to prevent chlorosis of sugarcane on highly alkaline, calcareous soils are too large to be economically feasible, although lowered pH value and increased permeability were brought about.

[**Soil Survey Reports, 1932 and 1935 Series**] (*U. S. Dept. Agr., Bur. Chem. and Soils* [*Soil Survey Rpts.*], *Ser. 1932, Nos. 30, pp. 34, pl. 1, figs. 2, map 1; 31, pp. 92, pls. 4, figs. 2, map 1; 1935, No. 1, pp. 56, figs. 2, map 1*).—These surveys were made in cooperation with the respective State experiment stations: 1932, Nos. 30, Bee County, Tex., H. M. Smith and R. M. Marshall, and 31, Franklin County, Pa., H. W. Higbee et al.; and 1935, No. 1, Edgefield County, S. C., F. R. Lesh et al.

Tennessee Valley soil survey project, J. W. Moon. (U. S. D. A.). (*Amer. Soil Survey Assoc. Bul. 17 (1936), pp. 63–67*).—The mapping of slope, erosion, stoniness, depth phases, and limestone sinks together with the use grouping, with reference to the characteristics mapped in the area in question, is briefly described.

Prairie soils of the Olympic Peninsula, Washington, L. C. Wheeting. (Wash. Expt. Sta.). (*Amer. Soil Survey Assoc. Bul. 17* (*1936*), *pp. 166–169*).—The author presents two cases in which "the soil conditions are definitely favorable for trees and yet the bracken ferns persistently hold their ground against the encroachment of the forest." As a possible explanation it is suggested that probably "the strongly acid, ligniceous organic matter and the favorable environmental conditions at the very beginning enabled the bracken ferns to grow so luxuriously and to such heights that tree seedlings have been subjected to dense shade and such strong competition for the limited supply of available nutrients that they could never persist long enough to reach above the canopy of ferns."

A comprehensive legend for soil maps, R. E. Storie. (Univ. Calif.). (*Amer. Soil Survey Assoc. Bul. 17* (*1936*), *pp. 109–111*).—The author considers that more complete information concerning the soils mapped than is now customary should be included with the map itself, and gives an illustrative example of such a summary as could be thus printed on a map. The added information includes among other points the "Storie index" of agricultural value (E. S. R., 70, p. 157).

New soil series names, 1934–35, C. F. Shaw. (Univ. Calif.). (*Amer. Soil Survey Assoc. Bul. 17* (*1936*), *pp. 100, 101*).—The author lists soil series names approved from October 1934 to the date of the report, including a list of series names used in Illinois in the State soil survey.

The relation of mechanical analysis to field textural classification, H. W. Lakin and T. M. Shaw. (U. S. D. A.). (*Amer. Soil Survey Assoc. Bul. 17* (*1936*), *pp. 112–115, fig. 1*).—It is shown that field texture cannot be judged fully by the texture indicated by ultimate mechanical analysis but should be considered in relation to a determination of aggregates also.

Limitations of the soil survey data and maps for land use planning, M. F. Morgan. (Conn. [New Haven] Expt. Sta.). (*Amer. Soil Survey Assoc. Bul. 17* (*1936*), *pp. 48–52*).—The author points out in part that "the agricultural scene is far less diverse than the soil pattern as indicated by the soil survey map. Recognition of every conceivable variation in color, texture, and parent material as a separate type may be taxonomically sound, but unless a definite grouping based on significant characteristics that affect crop adaptation and production is indicated by the person making the map, it cannot be readily used in evaluating soils from a practical standpoint. The wide variations in soil descriptions in county maps made in the same State from time to time make it almost impossible for persons engaged in land use planning to assign a definite potentiality to a soil mapped under the same name in various counties.

"The 'Bureau' system of classification tends to subordinate the important physical properties of soil that are inherent in textural characteristics. Thus, the soil series is often used as a basis for generalized groups. Two soils of distinct series, alike in textural class and topographic features, frequently present more similar crop production problems than different degrees of texture within the same soil series.

"No recognition of improvement or dissipation of soils at human hands has been given by the soil surveys. The basic concept of the features of a soil is obtained from studying it under as nearly virgin conditions as are possible. Yet in our important agricultural regions this is usually difficult to do, and is of only academic interest. Several generations of farmers on the soils of most of the United States east of the Great Plains have modified these soils to the extent that many naturally low-grade soils have been built up to high levels of productivity, and perhaps greater areas have been depleted by erosion and poor farming to the point where they are not economically reclaimed. The soil survey is now discovering that areas formerly mapped as Brookston are now Crosby, which is another way of stating that the former soil has been depleted of a surface layer containing an abundance of calcium-saturated organic matter by a combination of sheet erosion and the growing of tilled crops without regard to the maintenance of humus."

[Soil type and land use] (*Amer. Soil Survey Assoc. Bul. 17 (1936), pp. 68–82*).—The following papers deal with the relation of soil character, as expressed by certain soil types, to the choice of land, as follows: Alfalfa and bright tobacco in the Piedmont region of North Carolina, by C. B. Williams (pp. 68–73) (N. C. Expt. Sta.); irrigation farming, by W. G. Harper (pp. 74–76) (U. S. D. A.); grazing in the mixed prairie of North Dakota, by A. P. Nelson (pp. 77, 78); forestry in the cut-over pine lands of northern Michigan, by R. L. Donahue (pp. 79, 80) (Miss. State Col.); and resettlement in the Southeastern Coastal Plain region, by A. H. Hasty (pp. 81, 82).

Physical land inventory for replanning land use, J. S. Cutler and A. H. Paschall. (U.S.D.A.). (*Amer. Soil Survey Assoc. Bul. 17 (1936), pp. 53–56*).—The place in such appraisals of topography, soil type, nature and degree of erosion, and the existing vegetative cover is briefly indicated. In an analysis of four inventories, two of the reconnaissance type and two of the detailed type, the relative merits of the two systems are discussed.

Definitions of terms used in land utilization, C. E. Kellogg and C. P. Barnes. (U. S. D. A.). (*Amer. Soil Survey Assoc. Bul. 17 (1936), pp. 93, 94*).—Numerous terms given specialized connotations in land utilization planning are specifically defined.

Some soil conditions and associated factors likely to influence future land use, A. R. Whitson. (Univ. Wis.). (*Amer. Soil Survey Assoc. Bul. 17 (1936), pp. 57–62, fig. 1*).—The importance of topography, soil structure, organic matter content, water supply, and climate in the assignment of land to specific agricultural uses is briefly discussed.

Neutralization curves of the colloids of soils representative of the great soil groups, M. S. Anderson and H. G. Byers. (U. S. D. A.). (*Amer. Soil Survey Assoc. Bul. 17 (1936), p. 173*).—It is noted among other observations that colloids from the different soil groups differ widely in their fundamental acid character, and that the inorganic colloids are weaker than the acid of bentonite and are stronger than the acid of a halloysitic colloid whose silica: alumina ratio is very nearly 2. The stronger soil colloid acids are no more acid than silicic acid as regards pH, but have much greater base exchange capacity than silicic acid or any possible simple mixture of silicic acid and aluminum hydroxide.

A basis for rating the productivity of soils on the plains of eastern Colorado, L. A. Brown (*Colorado Sta. Tech. Bul. 25 (1938), pp. 19, figs. 2*).—By dividing the yield years into the four precipitation groups having, respectively, less than 14 in., from 14 to 17, from 17 to 20, and over 20 in., total for a year, and by statistical analysis, crop yield and precipitation records from four dry-land field stations in and near eastern Colorado were used as a basis for estimating probable yields on soils developed in the plains region of eastern Colorado. Normal yields and productivity ratings for the more important crops under the four rather narrow ranges in pecipitation and on two types of land were developed. With the U. S. D. A. Weather Bureau records as a basis, eastern Colorado was divided into three regions, according to the percentages of years that are normally in each of the four precipitation groups.

"Although Keith silt loam and Prowers loam were given the same productivity ratings under similar precipitation, it was readily shown that the average yield on the Keith soil was nearly three times as much as on the Prowers soils when the region in which they occur in eastern Colorado was considered and the distribution of good, fair, poor, and failure years accounted for."

Definitions of forest humus types, H. A. Lunt. (Conn. [New Haven] Expt. Sta.). (*Amer. Soil Survey Assoc. Bul. 17* (*1936*), *pp. 43, 44*).—Two main types only—"mull" and "mor"—are to be recognized. Mull is defined as a mixture of organic matter and mineral soil, crumbly granular or compact structure, transition to lower layers not sharp. Mor is defined as organic matter practically unmixed with mineral soil, usually more or less matted or compacted, transition to mineral soil always distinct, often composed of two layers named F-layer, or fermentation layer, resting on H-layer, or humified layer. The F-layer consists of more or less decomposed litter still recognizable and rather loose structure. The H-layer consists principally of finely divided organic matter unrecognizable as to origin, structure more or less dense.

Of the mulls, the author recognizes and defines the subclassifications coarse mull, fine mull, and firm mull. Of the mors, granular, greasy, and fibrous varieties are recognized and defined.

It is noted that the types mentioned generally concern the well-drained soils, while it may be desirable to use the term "peat" and other subdivisions for forest humus layers which are strongly influenced by ground water.

Definitions of forest humus types submitted, C. H. Bornebusch and S. O. Heiberg (*Amer. Soil Survey Assoc. Bul. 17* (*1936*), *p. 95*).—Lunt's definitions (see above) were adopted, together with the term "forest floor" to cover the entire accumulation of organic matter on the soil surface.

The soil profile and its interpretation, L. F. Gieseker (*Montana Sta., pp. 6, fig. 1*).—This is a brief, nontechnical summary of the factors affecting profile development, its indications as to the age of the soil, and the conditions under which it has developed, together with definitions of soil series and type and a land classification map based on wheat productivity and on acreage per steer 10 mo. grazing season in the case of grazing lands.

Profile characteristics of a western Washington soil, L. L. Anderson. (U. S. D. A.). (*Amer. Soil Survey Assoc. Bul. 17* (*1936*), *pp. 170–172*).—The soil of which a profile study is here briefly outlined was found to predominate in the upland area of Snohomish and Kitsap Counties, Wash., and is widely distributed in the section west of the Cascade Mountains. It is considered that it probably belongs to the Brown forest type. The presence of shot give it a unique structural characteristic. There is no evidence of alluviation processes having been active. The reaction of the solum is acid. The composition of the extracted colloids is like that of the soils of Southern United States.

Soil structure, E. W. Russell (*Imp. Bur. Soil Sci. [Harpenden], Tech. Commun. 37* (*1938*), *pp. 40*).—The author takes up the importance of soil structure, its specification, the classification of structure and of soil aggregates, control methods, crumb formation, and the application of structural analysis of soil to agricultural practice.

The significance of field structure in the water relations of soils, G. W. Musgrave. (U. S. D. A.). (*Amer. Soil Survey Assoc. Bul. 17* (*1936*), *pp. 155–162, figs. 2*).—Modifications of the structure of the soil in the surface 6 in. were manifested in the movement of water to a depth of at least as great as 3 ft. in two very different soils. The addition of organic matter increased water intake, reduced surface run-off, and greatly improved water relations within the entire soil profile.

Factors affecting downward movement of water in soils, G. B. Bodman. (Univ. Calif.). (*Amer. Soil Survey Assoc. Bul. 17 (1936), pp. 33–38, figs. 5*).—The author considers briefly three types of movement: (1) Movement through soils saturated throughout, (2) movement through soils unsaturated throughout, and (3) entry of water into columns from a region of complete saturation to one of unsaturation. Downward movement of soil water as determined by laboratory measurement through columns of disturbed soil packed into tubes and by field experiments with undisturbed, deep soil columns in situ, and the effects of texture, apparent density, temperature, and water content of the soil upon such movement are discussed.

The value and limitations of calcium in soil structure, R. Bradfield. (Ohio State Univ.). (*Amer. Soil Survey Assoc. Bul. 17 (1936), pp. 31, 32*).—The author cites two examples of soils containing both organic matter and calcium carbonate in percentages apparently quite sufficient for good structure, both soils being in practice unproductive and of very poor structure. These instances are thought to indicate "that while lime and organic matter may favor the development of a favorable structure in heavy soils, they do not in themselves insure a good granular structure. The best structure is usually found in virgin soils or in soils that have been in sod for several years."

Aggregation of soils and calcium ion saturation, L. D. Baver. (Univ. Mo.). (*Amer. Soil Survey Assoc. Bul. 17 (1936), pp. 28–30*).—The calcium ion may influence granulation directly by causing a flocculation of particles which may be bound together into stable aggregates, as by organic matter. Therefore, the present amount of exchangeable calcium in the soil would not be an indication of the stability of soil granulation. Calcium may influence granulation indirectly through its effect upon organic matter. It helps to preserve organic matter in the soil. It is concluded that calcium ions have important effects on soil granulation, but most of those observed are probably indirect rather than direct.

Comparative physical and chemical properties of an alkali spot and an adjoining normal soil of the prairie soils group, S. M. Ahi and W. H. Metzger. (Kans. State Col.). (*Amer. Soil Survey Assoc. Bul. 17 (1936), pp. 9–12, figs. 2*).—The authors present comparative profile descriptions of a "slick spot" soil and of a normal soil adjacent to it. The slick spot soil was lighter than many normal and productive soils and contained less colloidal material. There was, however, nearly 8 times as much exchangeable sodium in the slick spot soil as in the adjacent normal soil, also a lower carbon and nitrogen content and a higher silica: sesquioxide ratio.

Properties of colloids from dry land soils, I. C. Brown and H. G. Byers. (U. S. D. A.). (*Amer. Soil Survey Assoc. Bul. 17 (1936), pp. 13–19*).—The authors have shown that the water vapor absorption of the colloids at 99 percent humidity as compared with that at 75 percent humidity has a mean value of 2.14, and that this ratio is the most uniform characteristic of these colloids. It is also shown that the average composition of the inorganic soil acid of the 13 profiles is expressed by a mean silica: sesquioxide ratio of 3.31, a silica: alumina ratio 4.07, a water: sesquioxide ratio 2.27, and a water: alumina ratio 2.76. It is inferred that the environmental conditions of the dry-land soils tend to produce a colloid of the pyrophyllic acid type, approaching the ideal composition of the inorganic complex $3H_2O.Al_2O_3.4SiO_2$.

Further work on the determination of the mineral content of soil colloids, E. Truog. (Univ. Wis.). (*Amer. Soil Survey Assoc. Bul. 17 (1936), p. 20*).—To the working detail of the author's method already presented elsewhere (E. S. R., 79, p. 302), "it should be added that with certain soils containing large amounts of free iron oxides, especially in the form of hematite, it is necessary to prolong the sulfureted hydrogen treatment for a longer period than 0.5 hr. in order to effect complete removal of the free iron oxide. The method is far superior to any other previously tried, since, with most soils, it makes possible complete removal of the free iron oxides without material change of other constituents. The method is especially effective in cleaning mineral grains preparatory to petrographic analysis." The value of such a procedure in making possible the determination of the silica: sesquioxide ratio with the exclusion of the free iron oxides is also pointed out.

The relation of the calcium and hydrogen ions to some physico-chemical properties of clays, J. F. Lutz. (Univ. N. C.). (*Amer. Soil Survey Assoc. Bul. 17* (*1936*), *pp. 24–27, figs. 5*).—Though lime flocculates sodium saturated soils and thereby improves physical condition, the author points out that lime treatment of soils of a high degree of hydrogen-ion saturation may be expected to lessen flocculation and increase hydration of the colloids. He presents experimental data in support of this view.

The hydrolysis of calcium feldspar, L. T. Alexander and H. G. Byers. (U. S. D. A.). (*Amer. Soil Survey Assoc. Bul. 17* (*1936*), *pp. 21–23, fig. 1*).—By electrodialysis of a suspension of the finely ground mineral the authors obtained a nearly calcium-free product which in many ways was very similar to soil colloids of like composition.

Action of hydrogen peroxide on weathered mica, M. Drosdoff and E. F. Miles. (U. S. D. A.). (*Soil Sci., 46* (*1938*), *No. 5, pp. 391–395, pl. 1*).—Due apparently to the presence of manganese dioxide or other oxides catalyzing the decomposition of hydrogen peroxide between the laminae of soil micas, such micas are strongly exfoliated by hydrogen peroxide in a way which may modify the results of mechanical analysis. "In case of a soil containing the hydrated type of weathered mica, treatment with peroxide resulted in an increase in the coarse separates and a consequent decrease in the finer fractions. This was due to the cohesion of the exfoliated plates of mica when the soil was heated after the peroxide treatment. In case of a soil containing weathered mica not of the hydrated type, the opposite effect was obtained. The hydrogen peroxide tended to break up the larger pieces of mica into smaller flakes, thereby increasing the finer fractions and consequently decreasing the coarser fractions. Significant differences due to the peroxide treatment in the mechanical analysis would be expected only in soils high in mica, especially in the lower horizons where the mica particles are coarser and more abundant."

It is noted that this action of hydrogen peroxide may be used for separating the mica from other minerals with which it may occur. The thin flakes can be easily floated off in water while the other minerals sink quickly to the bottom of the vessel. This scheme was used successfully with the coarse fractions of a Mojave desert granite soil.

On the use of the term laterite, R. L. Pendleton (*Amer. Soil Survey Assoc. Bul. 17* (*1936*), *pp. 102–108*).—The author cites recent descriptions and studies of laterite, "showing that it is the hardened illuvial horizon of sesquioxides exposed by truncation of the profile through erosion. Laterite should therefore be considered as a soil, or a portion of a complete profile, and not a geological formation."

Conservation of the soil, A. F. Gustafson (*New York and London: McGraw-Hill Book Co., 1937, pp. XVII+312, figs. 195*).—The author, professor of soil technology in the New York State College of Agriculture at Cornell University, designed this work "for those concerned with land mortgages, for general readers, for county agricultural agents, and for use in college and high school courses in soil conservation." He devotes 7 chapters to the nature, causes, and results of water and wind erosion and the remaining 10 to a thorough treatment of control measures.

The broader aspects of soil conservation, M. F. Miller. (Univ. Mo.). (*Amer. Soil Survey Assoc. Bul. 17 (1936), pp. 146–149*).—This is a general summary of the problem of the preservation of our soils and of their productivity.

Some remarks on the scope and character of research in soil and water conservation, R. V. Allison. (U. S. D. A.). (*Amer. Soil Survey Assoc. Bul. 17 (1936), pp. 150–154*).—The author briefly outlines a program of which the five principal groups of projects are climatic and physiographic studies, soil and water conservation investigations, watershed and hydrologic studies, sedimentation and hydraulic studies, and economics of soil erosion control.

Conservation of the organic soils in the Sacramento-San Joaquin Delta, S. W. Cosby. (U. S. D. A.). (*Amer. Soil Survey Assoc. Bul. 17 (1936), pp. 116, 117*).—Dangers of injury to the valuable organic soils here discussed include failure of the protective levees, accumulation of salts and alkalinity, and fire. The last named danger is stressed as the most serious. Both intentional burning-over and spectacular uncontrolled conflagrations occur. Even controlled "light" burning is shown to be a very destructive practice.

A direct method of aggregate analysis of soils and a study of the physical nature of erosion losses, R. E. Yoder. (Ala. Expt. Sta.). (*Amer. Soil Survey Assoc. Bul. 17 (1936), p. 165*).—The method consists essentially in allowing a given quantity of air-dry soil to slake through a graded nest of screens immersed in a constant volume of water. The nests of screens are mechanically raised and lowered at a slow rate for a constant time interval to facilitate separation of the various sized aggregates.

Committee on nomenclature, sub-committee on erosion terms, J. M. Snyder and A. H. Paschall (*Amer. Soil Survey Assoc. Bul. 17 (1936), pp. 96, 97*).—The authors list and define 35 terms.

Nomenclature committee of the International Society of Soil Science, C. F. Shaw. (Univ. Calif.). (*Amer. Soil Survey Assoc. Bul. 17 (1936), pp. 98, 99*).—This is a committee report mainly concerned with definitions noted above.

Soil erosion control, A. E. Burges (*Atlanta, Ga.: Turner E. Smith & Co., 1937, rev. ed., pp. XVII+221, [figs. 73]*).—The author expresses the opinion that although much has been written concerning soil erosion, this material has usually been contributed "by those only superficially acquainted with the subject or by specialists unable to see the subject as a whole. . . . Not until now has there been available to the public any book in which this bewildering mass of data has been reduced to its essentials. This volume presents erosion control as an organized whole—a new science borrowing freely from soils, agronomy, forestry, animal husbandry, and engineering, yet being none of these. As it is developed here, soil erosion control embraces every phase of farm management which has a bearing on the preservation of the soil."

The role of strip-cropping in erosion control in the blacklands of Texas, E. B. Deeter. (Tex. Expt. Sta.). (*Amer. Soil Survey Assoc. Bul. 17 (1936), pp. 163, 164*).—The author reports experiments (E. S. R., 76, p. 323) in which erosion was markedly reduced by alternate strip cropping of oats with cotton as compared either with cotton grown in rows down the slope or cotton alone on the contour. He further expresses the opinion that where terracing is also needed but cannot be done at once, strip cropping "will usually afford an excellent degree of protection until it is found possible to terrace the land."

Efficiency of the moisture supply, R. Deland and T. J. Dunnewald. (Univ. Wyo.). (*Amer. Soil Survey Assoc. Bul. 17 (1936), pp. 39, 40*).—Loss of moisture by evaporation during the natural melting of snow and ice was shown. Experiments in which plants were grown in soils from which evaporation was prevented by covering the surface with petroleum jelly, the experiment being continued until permanent wilting took place and the moisture content of the soil then determined, were also carried out. A light fine sandy loam had retained but 5 percent of moisture at permanent wilting, whereas a heavier soil, of loam texture, held from 13 to 15 percent of moisture when the test plants wilted.

A study of root distribution in prairie claypan and associated friable soils, E. G. Fitzpatrick and L. E. Rose. (U. S. D. A. and Okla. Expt. Sta.). (*Amer. Soil Survey Assoc. Bul. 17* (*1936*), *pp. 136–145, figs. 7*).—Most of the roots were found to occur in the topmost 30 in. in each type of soil. A few roots reached a depth of 54 in. A fairly high concentration of roots was found in the topmost 3 in., with a slightly lower concentration at a depth of 6 in. in each soil. An increase in the concentration of roots was found in heavier textured horizons, this increase being greatest in clay pans. Roots penetrated throughout the clay pan rather than following around the outsides of clay pan columns. A marked decrease in root concentration was found in gray layers and incipient gray layers lying immediately above clay pans. Poor drainage of this horizon may, it is believed, explain this condition.

Soil studies of brown root rot of tobacco.—I, Effect of certain crop residues on some forms of nitrogen, H. J. Atkinson and C. H. Robinson (*Sci. Agr., 18* (*1938*), *No. 12, pp. 685–694*).—Soil samples from two localities were treated with ground-up residues of corn, timothy, oats, and alfalfa, and maintained at a moisture content corresponding to ±60 percent of the water-holding capacity of the soils. Two series were held at ±20°–25° and a third at ±10° C. Analyses were made at intervals for ammonia-, nitrite-, and nitrate-nitrogen.

Addition of these residues failed to cause appreciable accumulation of ammonia in the soil, with the exception of the alfalfa stubble in which case there was also a large accumulation of nitrate-nitrogen. With the exception of the alfalfa there was also no appreciable accumulation of nitrites. All residues caused an initial depression in the accumulation of nitrates, the effect of alfalfa being brief, that of corn less than for timothy, and that of oats lasting the longest. Incubation of soil samples at 10° caused no accumulation of ammonia or nitrites, and nitrates accumulated as would be expected perhaps somewhat more slowly due to the effect of the lower temperature on the activities of the micro-organisms. Addition of these residues seemed to have no effect on the exchangeable hydrogen or calcium. It thus does not appear that corn or timothy residues (brown root rot of tobacco appearing to follow both of these crops) have any more pronounced effect on the three forms of nitrogen studied than have oat residues, when the same amount of each is added to the soil. All depress the initial accumulation of nitrates, but the effect of corn and timothy disappears before that of oats.

Lysimeter studies with the decomposition of summer cover crops, R. M. Barnette, H. W. Jones, and J. B. Hester (*Florida Sta. Bul. 327* (*1938*), *pp. 44, figs. 3*).—The effects of *Crotalaria striata*, velvetbeans, and Natal grass as cover crops upon the soil used and upon lemon seedlings grown in the lysimeter tanks were studied in two sets of experiments, which are separately reported in detail. The lemon seedlings averaged, in one of the experiments, 2.73 times the dry weight of those without cover crop when grown with the *Crotalaria*, and 2.88 times when the velvetbean cover crop was used. Detailed results of the effects of the cover crops, variously handled, upon the plant food content of the soil and its leaching are given.

The influence of environmental factors on numbers of soil microorganisms, W. G. E. Eggleton (*Soil Sci., 46* (*1938*), *No. 5, pp. 351–363*).—In a study of the microbiology of grassland soil at Shanghai, China, statistical analysis indicated a strong positive association between numbers of bacteria, shown by plate counts, and the moisture status of the soil. This relationship was apparent in untreated soil as a result of natural variations in soil moisture, and irrigation during the summer months also significantly increased the numbers of bacteria. A similar, though less well-established, relationship appeared to exist between the soil moisture content and the numbers of actinomyces and fungi. Between the limits experienced, soil temperature and soil reaction appeared to exert no measurable influence on numbers of organisms.

It is suggested that the seasonal changes in moisture and temperature are not the direct causes of the seasonal changes in numbers of bacteria, but that in controlling the growth of the herbage these climatic factors control the amount of energy material reaching the micro-organisms in the form of root excretions or sloughed-off root material.

Soil improvement for florists, R. B. Farnham. (Rutgers Univ.). (*Florists Exch. and Hort. Trade World, 91 (1938), No. 17, p. 17*).—This very brief discussion is largely concerned with the production and maintenance of a good physical condition. The values of correct lime content, of the activity of soil micro-organisms, of inert mineral materials, such as coal ashes, and of compost or other organic materials are among the topics taken up.

Abstracts of papers presented before the division of fertilizer chemistry of the American Chemical Society at Milwaukee, Wisconsin, Sept. 5–9, 1938 (*Com. Fert., 57 (1938), No. 4, pp. 16, 18, 20, 21, 23–25*).—These include abstracts of papers presented from State experiment stations, universities, and the U. S. Department of Agriculture as follows: Recent Studies on Boron in Soils, by J. A. Naftel (Ala.); The Determination of Boron in Soils and Plants, by K. C. Berger and E. Truog (Univ. Wis.); The Problem of the Principal Secondary Elements in High-Analysis Mixtures, by W. H. Ross and K. C. Beeson (U. S. D. A.); Constituents, Elements, and Growth Producing Substances in Activated Sludge (Milorganite), by C. J. Rehling and E. Truog (Univ. Wis.); The Agricultural Significance of the Minor Elements, by W. O. Robinson, The Complete Composition of Commercial Mixed Fertilizers, by F. O. Lundstrom and A. L. Mehring, The Effect of Varying the Conditions of Treatment on the Quality of Nitrogen in Ammoniated Peat, by R. O. E. Davis and W. Scholl, and Soil Tests in Relation to Crop Yields, by M. S. Anderson (all U. S. D. A.); and The Fate of Potassium Applied to Some Illinois Soils, by L. K. Wood and E. E. DeTurk (Univ. Ill.).

Rationalizing the use of fertilizer, J. C. Lowery. (Ala. Polytech. Inst.). (*Natl. Fert. Assoc. Proc., 14 (1938), pp. 53–65, figs. 2*).—The author reports as results of an educational program that the tonnage of 6–8–4 fertilizer used in Alabama in 1937 was nearly double that used in 1936, that from 65 to 80 percent of such grades as 3–8–5 and 4–8–4 were supplemented with side dressings to bring the nitrogen applied up to the experiment station standard, and that "farmers are now interested, more than at any time in the past, in using the most efficient fertilizer." It is further noted that the percentage of nitrogen in the average fertilizer has been more than tripled since 1911, losses due to acid-forming fertilizer have been eliminated, the number of grades of mixed fertilizers has been reduced to 12, more efficient cotton production has resulted, and more land and labor have been released for production of food and feed for farm consumption.

Commercial fertilizers report for 1938, E. M. Bailey (*Connecticut [New Haven] Sta. Bul. 417 (1938), pp. 56+VIII*).—With this annual report on the composition of commercial fertilizers and fertilizer components are given the usual analyses and a summary statement of the requirements of the State control law and official definitions of fertilizer materials and interpretations of terms.

AGRICULTURAL BOTANY

The physiology of plants, W. Seifriz (*New York: John Wiley & Sons; London: Chapman & Hall, 1938, pp. VII+315,* [*pls. 2*], *figs.* [*94*]).—The author presents this textbook for the college student with a background in general botany, physics, and chemistry in the hope that it will bring about not only an acquaintance with experimental data but also an understanding of the principles and problems in plant physiology. Three qualities especially striven for were the avoidance of finality in statement, frequent reminders of the bearing of plant physiology on commonplace experiences, and a presentation as fluent and readable as is consistent with scientific accuracy. The biliographies closing each chapter are to be regarded as the author's choice of an introduction to collateral reading.

Plant physiology, N. A. Maximov, edited by R. B. Harvey and A. E. Murneek (*New York and London: McGraw-Hill Book Co., 1938, 2. Eng. ed., pp. XXII+473, pl. 1, figs. 144*).—This edition of the work previously noted (E. S. R., 69, p. 341) is translated and revised from the fifth Russian edition. The author "has completely rearranged the text, rewriting a major part of the discussion, and has introduced new materials from the data of recent research. . . . This is a completely new book, bringing up to date the results of plant physiological research throughout the world."

Applied mycology and bacteriology, L. D. Galloway and R. Burgess (*London: Leonard Hill, 1937, pp. IX+186,* [*figs. 4*]).—This book is intended as a brief survey of the field of mycology and bacteriology which it is hoped will be of some service to biologists and chemists in coordinating their studies with those of other workers and in indicating the scope and methods of economic microbiology. Part 1 covers the general field and part 2 the food, fermentation, and textile industries, hygiene and medicine, agricultural applications, and miscellaneous matters.

The chemistry of plant constituents, O. Gisvold and C. H. Rogers (*Minneapolis: Burgess Pub. Co., 1938, pp.* [*2*]*+X+309*).—The subject matter of this book treats of the chemistry of plant constituents and some of the theories advanced to explain their formations. It is particularly concerned with the seed plants, and especially the angiosperms, but those plants of other groups which are of theoretical, medical, or pharmaceutical interest are also discussed. Bibliographic footnotes and an index are included.

The significance of trace elements in the nutrition, growth, and metabolism of plants [trans. title], K. Pirschle (In *Ergebnisse der Biologie. Berlin: Julius Springer, 1938, vol. 15, pp. 67–165*).—This is a comprehensive, analytical review of the subject, with over 30 pages of literature references.

Boron as a plant nutrient, D. Harding and C. M. Schmidt (*Washington, D. C.: Amer. Potash Inst., Inc., 1938, pp.* [*3*]*+83+XVI*).—This mimeographed annotated bibliography endeavors to cover the literature from January 1936 to June 1938 dealing with the plant food aspects of boron. The first section deals with boron in its general soil and plant aspects. This is followed by a section arranged alphabetically by crops, with subarrangements geographically and by authors. The index also includes arrangement by title.

The essentiality of gallium to growth and reproduction of Aspergillus niger, R. A. Steinberg. (U. S. D. A.) (*Jour. Agr. Res.* [*U. S.*], *57* (*1938*), *No. 8, pp. 569–574*).—By growing this fungus in quartz Erlenmeyer flasks at

35° C. for 4 days in nutrient fluids composed of sucrose extracted with alcohol, water distilled successively in Acree, pyrex glass, and quartz stills, and spectroscopically pure salts, it was demonstrated that Ga 0.01–0.02 mg per liter is essential to its growth and development. On omitting this element, yields as low as 38 percent of the maximum were obtained, and it appeared to be necessary in addition to Fe, Zn, Cu, Mn, and Mo.

Plant growth-substances: Their chemistry and applications, with special reference to synthetics, H. NICOL (*London: Leonard Hill, 1938, pp. XII+109,* [*pls. 4*], *fig.* [*1*]).—The main sections of this book deal, respectively, with the synthesis of growth substances, results of scientific work on the effects of synthetic growth substances, growth substances from natural sources, occurrence of growth substances (other than auxin) and bodies related thereto in urine, chemistry in relation to growth, classification and nomenclature of growth substances, and the identification of growth substances and related materials. A tabular list of growth substances, an author index, a list of important plants, and literature references are included.

The influence of bios on nodule bacteria and legumes.—B, Influence of crude bios preparations on acid production by strains of Rhizobium trifolii, D. G. LAIRD and P. M. WEST (*Canad. Jour. Res., 16* (*1938*), *No. 9, Sect. C, pp. 347–353*).—Continuing this series (E. S. R., 77, p. 760), "certain components of Wildiers' bios complex, fractionated and concentrated according to the procedure of Miller [1] and co-workers, were found capable of replacing the stimulative action of yeast extract on strains of *R. trifolii*, as measured by acid production. Bios 1 was inactive, while bios 2 (b, v) and 2 (a) possessed definite activity, the potency of the fractions increasing in the order named. Moreover, the ability of these fractions to increase hydrolysis of urea by urease was in direct proportion to the stimulative effect exerted by them on the *Rhizobia*. These effects could not be brought about in synthetic media by the addition of crystalline vitamin B_1, nicotinic acid, uracil, choline, β-alanine, carnosine, β-indoleacetic and β-indolebutyric acids, glutathione, cysteine, and vitamin C."

The effect of colchicine on the developing embryo sac of Tradescantia paludosa, R. I. WALKER. (Univ. Wis.). (*Jour. Arnold Arboretum, 19* (*1938*), *No. 4, pp. 442–445, pls. 2*).—The response of somatic (E. S. R., 79, p. 605) and microspore (E. S. R., 79, p. 464) mother cells of *T. paludosa* to colchicine has been previously described. Its effect in disturbing the polarity of the cell is even more striking in the developing embryo sac, as shown by the studies here reported. The suppression of meiosis and mitosis is brought about by the effect on the cytoplasm. In all cases the effect of colchicine on the cyptoplasm was the same—an alteration of the normal polarity of the cell.

Coenzyme R requirements of rhizobia, F. E. ALLISON and F. W. MINOR. (U. S. D. A.). (*Soil Sci., 46* (*1938*), *No. 6, pp. 473–483*).—*Rhizobium trifolii, R. meliloti, R. leguminosarum, and R. phaseoli* (19 typical strains) were found to require coenzyme R for appreciable growth. Iron failed to act as a substitute for the essential growth substance. Reducing substances (e. g., thioglycolic acid and cysteine) had very little effect on growth either in the presence or absence of coenzyme R, and the need for accessory growth substance was equally evident whether the nitrogen source was $NaNO_3$, NH_4Cl, or asparagin. The total growth of rhizobia over a limited range of concentrations of coenzyme R was very roughly proportional to the amounts added (except in some cases at the higher concentrations). These new data are said to agree with the authors' previous results (E. S. R., 70, p. 601). The chemical nature of coenzyme R has not been determined, but it is believed to be unquestionably an organic compound. It is synthesized by many organisms and produces a marked increase in the respiration and growth of rhizobia.

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[1] Roy. Soc. Canada, Trans., 3. ser., 30 (1936), Sect. III, pp. 99–103.

The combined effect of light and gravity on the response of plants to growth substances, P. W. Zimmerman and A. E. Hitchcock (*Contrib. Boyce Thompson Inst., 9 (1938), No. 5, pp. 455–461, figs. 2*).—Stems (mainly tomato) treated unilaterally with lanolin preparations of growth substances made pronounced bendings in the dark or under light from all directions. This was also true of stems treated immediately on placing the plants horizontally or in unilateral light. When plants were allowed to make natural tropic responses before application of the synthetic substances, the induced responses were greatly modified. Also there was a difference in natural response when plants were placed in a horizontal position while in an enclosure with unilateral lighting. After a natural response these plants showed a combined effect of light and gravity when treated on the original upper side of the stem, presumably due to unequal distribution of natural substances first caused by the force of gravity and then by light.

Synthetic growth substances applied at distal parts of tomato stems were extracted and identified by the colorimetric method as indole derivatives. Indolebutyric acid applied to the basal end of a horizontal stem was unequally distributed, more going to the lower than to the upper side. The extracted substance was not definitely identified as indolebutyric acid, but it was physiologically active and the color reaction strongly resembled that of the acid applied to the base of the shoot. The facts suggested that the indolebutyric acid molecule might have remained intact in the tissue.

Auxin production in seedlings of dwarf maize, J. Van Overbeek (*Plant Physiol., 13 (1938), No. 3, pp. 587–598, figs. 8*).—In continuation (E. S. R., 73, p. 759), the author studied the amount of auxin given off by the coleoptile tips of etiolated seedlings. Washing the cut surfaces increased the amount diffusing into agar blocks, and the tips continued to give off auxin at an approximately constant rate for several hours after cut off. Isolated tips as short as 1 mm continued to give off auxin for more than 6 hr. at only slightly reduced rate at the end of the period. Auxin production varied with age of seedling, being optimal at 5–6 days after sowing. Seeds producing nana dwarfs contained the same amount of auxin as those producing normal plants. When 4–5 days old these dwarfs produced less auxin than normal plants, while at 6–7 days the amounts were equal. However, the amount of auxin reaching the growing zones of the 6- and 7-day-old nana plants was much smaller than normal, due to the greater destruction of auxin in the nana dwarfs. Auxin production in dwarf-1, 2, 3, and 7, and in the pigmy dwarf was lower than that in their normal sibs.

Electrical polarity and auxin transport, W. G. Clark (*Plant Physiol., 13 (1938), No. 3, pp. 529–552, figs. 6*).—The author has presented previous evidence (E. S. R., 77, p. 460) that the electric polarity in several plants is in the right direction to explain the basal, polar transport of the negative ion of heteroauxin, and (E. S. R., 75, p. 318; 79, p. 26) that gravity, light, and applied potentials could reverse the inherent electric polarity without affecting the polar transport. In the present contribution it was indicated that sections of pea or oat coleoptiles are reversibly polarized by direct currents beyond certain thresholds of applied current, and that the normal electric polarity may be reversibly increased or decreased or reversed by these currents. Apical negativity (normal polarity) was increased, within limits, on stimulation by alternating currents, but only after certain thresholds of applied currents were reached. Oat coleoptiles did not act as ohmic rectifiers of an alternating current, nor did they display a unipolar resistance to a direct current. This is taken to mean that a possible asymmetry in membrane permeability linked with polar transport cannot be analyzed by simple unipolar or rectifier measurements.

The apical negativity of oat coleoptile sections was reversibly decreased by ether narcosis, and the P. D. (potential difference) dropped to that induced by gravity when narcosis was irreversible. The resistance of oat coleoptiles reversibly decreased on passage of small direct currents and alternating currents. The resistance changes followed the inherent P. D. changes, but in the opposite sense except in complete irreversible ether narcosis, where both resistance and P. D. decreased. Polar heteroauxin transport in oat coleoptiles may be specifically abolished with sodium glycocholate (1:100,000 in water), without change in electric polarity, respiration, semipermeability, growth by cell elongation, or protoplasmic streaming. Lateral and longitudinal transport of auxin-a are said to be due to entirely different mechanisms. The apparent relation of auxin transport in plants to ion accumulation by barley roots is believed to be somewhat questionable, since sodium glycocholate abolishes the former but has no effect on the latter. Further support is lent to the author's previous statements that electric polarity expressed in terms of inherent P. D.'s (unipolar conductance, or rectification of alternating current) has no apparent causal relation to polar auxin transport in plants.

A bibliography of 45 references is included.

Hormones and the analysis of growth, K. V. Thimann (*Plant Physiol., 13 (1938), No. 3, pp. 437–449, figs. 11*).—In this address before the American Association for the Advancement of Science, the author presents a constructive review of recent work, including his own findings, on the physiology of growth substances in relation to the mechanism of acceleration, inhibition, and correlation of growth phenomena in plants. He stresses two points, viz, (1) that the problem is one of plant physiology, not pharmacology, since "we do not . . . simply apply all kinds of substances externally to plants, but we are engaged in the study of processes which go on in the normal plant;" and (2) that the question is not purely academic. For example, "one immediate result of the work has been . . . the elucidation of the action of auxins in causing root formation on cuttings, a finding of immediate practical utility."

Breaking the dormancy of seeds of Crataegus species, F. Flemion (*Contrib. Boyce Thompson Inst., 9 (1938), No. 5, pp. 409–423, figs. 2*).—Seeds of all *Crataegus* species have dormant embryos which must undergo a low-temperature period in a moist medium before germination, and some species have in addition a coat effect which must be eliminated prior to the afterripening at low temperature. By combining concentrated H_2SO_4 treatment with a short period at high temperature seedlings can be obtained at any desired time. For maximum germination the seeds must be in a moist medium during the high-temperature period. The subsequent required period in a low-temperature medium is obtained by keeping the seeds at controlled low temperature or by wintering outdoors. Evidence presented indicates that seeds can be pretreated and shipped to various destinations. It is claimed that by proper treatment all *Crataegus* species studied can be obtained on a large scale the first spring after the seeds ripen. Details of procedure are given.

Combining treatments for disinfecting potato tubers with treatments for breaking dormancy, F. E. Denny (*Contrib. Boyce Thompson Inst., 9 (1938), No. 5, pp. 397–402*).—Treating recently harvested intact tubers with vapors of ethylene chlorohydrin after disinfection with $HgCl_2$, yellow oxide of mercury (HgO), or formaldehyde hastened germination. It was also found feasible to treat the tubers with chlorohydrin before disinfection. Germination was not usually as rapid with tubers disinfected before or after treatment as with those treated with chlorohydrin alone, but the time for 90 percent emergence of sprouts of disinfected tubers was shortened by 30 to over 100 days by the chlorohydrin treatment. Retarded germination was noted when tubers were disinfected with either of the mercury compounds but not treated with chlorohydrin. Tubers previously disinfected with $HgCl_2$ or HgO proved unsuitable for use with the chlorohydrin "dip" method (tubers cut into pieces before treatment), since much rotting of seed-pieces resulted here. Cut tubers responded well to this dip method when the disinfectant previous to cutting was formaldehyde. Whichever of these three disinfectants was used before cutting, soaking the cut tubers for 1 hr. in solution of 1 percent sodium thiocyanate or 2 percent thiourea hastened germination by 20–80 days.

Leaf-epinasty tests with volatile products from seedlings, F. E. Denny (*Contrib. Boyce Thompson Inst., 9 (1938), No. 5, pp. 431–438*).—Young seedlings of 19 species (mostly vegetables), growing in closed flasks for 2–4 days to permit accumulation of gases, formed volatile products causing epinasty in potato leaves. With 7 other crop plant species the volatile products of seedling growth in a single flask proved incapable of inducing epinasty, but did so when the air from several flasks was absorbed in a single sample of the mercuric nitrate-nitric acid reagent used and then released from it. With various species of Cruciferae, and especially with radish, the seedlings produced, in addition to the epinasty-inducing volatile product, another gas which killed the potato test-plants. This appeared to be a mustard oil released by hydrolysis of glucosides of the seeds during germination. Methods for separating these two gases and for demonstrating their activities separately were found and are described.

The mechanism of delayed killing of maize seeds with X-radiation, L. R. Maxwell. (U. S. D. A.). (*Natl. Acad. Sci. Proc., 24 (1938), No. 9, pp. 377–384, figs. 4*).—For the death of single-celled organisms it is frequently found that survival-dosage curves show a simple exponential relationship indicating the presence of one sensitive volume which requires only one hit or penetration by an electron to produce death. When multicellular systems are studied it is usually found that the survival curves are no longer exponential but have a sigmoid shape. The hit theory in this case has two alternatives, viz, death either occurs from a number of hits within one sensitive volume or a different number of hits within two or more sensitive volumes. Certain tests of this theory are described for the X-irradiation of maize seeds. On the basis of the results obtained it is believed safe to conclude that if multiple sensitive volumes do exist they are not contained within a spherical volume whose diameter is less than 0.5 mm.

Photosynthesis, W. M. Manning (*Natl. Res. Council, Reprint and Circ. Ser., No. 108 (1938), pp. 117–156, figs. 9*).—This is a comprehensive, analytical review (with 94 literature references), taking up in turn the measurement of photosynthesis, a general description of the photosynthetic process, and the role of chlorophyll therein.

Limiting factors in photosynthesis: Light and carbon dioxide, E. L. Smith (*Jour. Gen. Physiol., 22 (1938), No. 1, pp. 21–35, figs. 6*).—Extensive measurements were made relating photosynthesis and light intensity for a large range of CO_2 concentrations, and relating photosynthesis and CO_2 at different light intensities. From these "families" of curves the limiting factor relationship could be secured for any value of photosynthetic rate. An equation was derived for describing these relations between the intensity and CO_2 concentration necessary to produce a definite amount of photosynthesis. This equation is said to furnish an exact description for all the data except those for low photosynthetic rates, for which a slightly different equation is required. The nature of the two equations suggests that a simple first order reaction determines the velocity of the light process at low photosynthetic rates, but that at high rates the mechanism is complicated by another factor.

The absorption of carbon dioxide in photosynthesis, K. V. THIMANN (*Science, 88 (1938), No. 2291, pp. 506, 507*).—The author suggests the desirability of investigating the possibility that in photosynthesis there may first be a combination of CO_2 with an organic acid, followed by the photoreduction of the carboxyl group and consequent intramolecular changes leading finally to the setting free of the organic acid again, a cycle in which some of the organic acid would doubtless be reduced to sugar.

X-ray diffraction analysis and its application to the study of plant constituents, W. A. SISSON (*Contrib. Boyce Thompson Inst., 9 (1938), No. 5, pp. 381–395, figs. 7*).—By this method the presence of amorphous material and the identity of several crystalline materials were demonstrated in the young cotton fiber. The limitations of the method for qualitative and quantitative analyses are discussed and illustrated in the detection of cellulose in lignin and at the early stages of cotton fiber growth. Development of orientation in the growing fiber is discussed, and the X-ray orientation is compared with the microscopic structure. The possibilities of X-rays for determining crystal structure and for study of chemical reactions and the phenomenon of swelling are noted briefly. The limitations and possible correlations of X-ray with microscopical data are illustrated with applications to *Halicystis*.

Correlation between growth of excised root tips and types of food stored in the seed, G. C. GALLIGAR (*Plant Physiol., 13 (1938), No. 3, pp. 599–609, figs. 2*).—The author found some correlation in growth behavior of excised root tips with type of food stored in the seed of sunflower, cotton, castor bean, smooth and wrinkled peas, sweet corn, dent corn, Hopi Indian corn, and soybean. All root tips from seeds or grains high in starch reserves grew well, those from seeds selected for oil and sugar varied widely in growth behavior, and those from seeds with high protein reserves proved least able to maintain growth. No diurnal growth rhythms were observed, and no correlations were found between growth behavior and phyletic origin of root tips. Root tips of Reid Yellow Dent corn, Hopi corn, sweet corn, and sunflower maintained an active growing condition longer and achieved a greater total elongation and final dry weight than those of any other plants tested.

Vitrification and crystallization of protophyta at low temperatures, A. and S. S. GOETZ (*Amer. Phil. Soc. Proc., 79 (1938), No. 3, pp. 361–388, figs. 10*).—The conditions determining whether a homogeneous liquid will solidify into the crystalline or into the vitreous state are discussed, and a brief account of the role of the speed of crystallization and that of grain formation is given. These concepts are applied to the causes of the death due to crystallization of nondehydrated organic cells, and the physical conditions of cooling are developed under which such organisms can be solidified with a minimum of crystallization, assuring to this extent the preservation of their potential life. Yeast (*Saccharomyces cerevisiae*), obtained as commercial bread yeast and suspended in Ringer's solution where it remains stable for several hours, was used in the experiments reported, and for each set of tests new yeast was used.

Nuclear control of cell activity, D. F. JONES. (Conn. [New Haven] Expt. Sta.). (*Science, 88 (1938), No. 2287, pp. 400, 401*).—The author presents pertinent data on nuclear control, with special reference to single cell mosaics exhibiting changes in color, starch formation, and size and shape of cells in maize seeds. Certain external agents also can initiate changes in cell activity. They are either similar in action to substances originating in the nucleus or they act on the nuclear material in such a way as to induce the production of more or less of the same substances. It is believed that the effect of these external agents is an indirect one, first altering the nuclear constituents, and these in turn having their effect in the usual way.

The water relations of plant cells, B. S. Meyer. (Ohio State Univ.). (*Bot. Rev., 4 (1938), No. 10, pp. 531–547, figs. 3*).—The author discusses the subject from a theoretical viewpoint, but one which he believes to be in entire accord with experimental facts and with accepted thermodynamic principles. For several years he has used the terminology and principles discussed with considerable success in interpreting osmotic movement of water in plants to students and workers in plant physiology, and this paper is written in the hope that these concepts will also prove serviceable to other plant physiologists. The subject matter is taken up under osmosis and osmotic pressure, imbibition and imbibition pressure, the osmotic relations of plant cells, the dynamics of intercellular movement of water in plants, and the water relations within individual cells. The viewpoint developed is valid only insofar as the direction of cell-to-cell movement of water in plants can be regarded as controlled by differences in the diffusion pressure of water, but attention is called to the possibility that other mechanisms may also operate and should not be overlooked.

Water relations in Bryophyllum calycinum subjected to severe drying, W. B. Welch (*Plant Physiol., 13 (1938), No. 3, pp. 469–487, figs. 2*).—The present study was undertaken because, although measurements of unfreezable ("bound") water in plant tissues had been frequently employed in attempting to interpret the changes occurring in cold hardening, very little had been done on drought resistance in relation to the unfreezable water content. In the whole *Bryophyllum* plant, in general, a correlation was found between age of tissue and percentage of unfreezable water, i. e., the older the tissues the greater was the percentage of unfreezable water. The bud, however, contained less than did tissues intermediate in age. As the leaf dried out the percentage increased as a result of the loss of freezable ("free") water by evaporation, but this increase in unfreezable water did not appear to be responsible for the water-retaining capacity of the leaf but rather to be a result of the drying. In the plantlets, where there was the greatest ability to retain the water against atmospheric drying, there was less correlation between the unfreezable water and the drying than in the drying of the parent leaf. The youngest plants on the margin of the leaves had the greatest percentage of unfreezable water. It is believed that the reduced internally exposed surface and the reduced number of stomata may be responsible for the ability of *Bryophyllum* leaves to retain water. There are 24 literature references.

Conductivity measurements of plant sap, G. A. Greathouse. (U. S. D. A.). (*Plant Physiol., 13 (1938), No. 3, pp. 553–569, figs. 2*).—The basic principles, apparatus, and precautions needed to determine the specific conductance of solutions are discussed. Data are presented as indicating that conductivity values obtained with plant sap must be cautiously interpreted, and a list of factors that may affect them is given, with discussion of each. The electrodialysis data given indicate that the lower conductivity of the expressed sap from cold-hardened plants was not due entirely to fewer ions, but was probably influenced by adsorption, viscosity, ionization, etc. The conductivity of plant sap was found to decrease on addition of nonelectrolytes in small amounts, but with further additions it increased. The interaction of solute and solvent is said to be of major importance in interpreting electrical conductivity data. Certain applications and limitations of specific conductance measurements, and a literature list of 42 entries, are given.

Contact effects between plant roots and soil colloids, H. Jenny and R. Overstreet. (Univ. Calif.). (*Natl. Acad. Sci. Proc., 24 (1938), No. 9, pp. 384–392, figs. 5*).—The prevailing theories of mineral absorption by plants from soils are based on the concept of the soil solution, which is identified, essentially, with the nutrient solution of the plant physiologist. The roots excrete carbonic acid into the liquid phase surrounding the soil particles. The H ions replace K from the surface of soil colloids, and the resulting $KHCO_3$ is now ready for intake by the roots. A theory for an additional method of mineral intake by plants from soils is here proposed, based on the phenomenon of ion interchange existing between two surfaces in contact. In view of the experimental results obtained, it is believed that our concepts of the mechanism of mineral absorption must be modified and extended. The results indicate that the intake of ions is not unidirectional, but that ions of the same species may move both into and out of the root at the same time. The outgo is especially pronounced when the roots are in contact with colloidal systems. Accumulation and depletion are only net effects of ionic movements.

Notes on native and exotic plants in Region 8, with special reference to their value in the soil conservation program, L. N. Goodding (*U. S. Dept. Agr., Soil Conserv. Serv., 1938, No. 247, pp. 2+152, pls. 5*).—Notes are included on over 500 plants or plant groups from the Pteridophyta to the Compositae, inclusive, and an index to common and Latin names is provided. Habit of growth, habitat requirements, distribution, seed production, aboriginal uses, and characteristics affecting importance in soil binding or potential usefulness of the products of the various plants and groups are touched on. The territory covered includes the States of Arizona, Colorado, New Mexico, Utah, and Wyoming (Fremont and Hot Springs Counties).

A preliminary study of the larger aquatic plants of Oklahoma, with special reference to their value in fish culture, J. H. B. de Gruchy (*Oklahoma Sta. Tech. Bul. 4 (1938), pp. 31, figs. 69*).—"The main object of this paper is to make available practical general knowledge relative to the larger aquatic plants, knowledge based upon notes gathered through the author's personal observations. The desirable and undesirable qualities, with the relative values for each plant, are given with the hope that they may be of some aid in selecting plants with which to stock ponds." Tabulated data are presented for 119 species, for which both Latin and common names are given.

A comparative study of the subterranean members of three field grasses, H. J. Dittmer (*Science, 88 (1938), No. 2290, p. 482*).—A comparative study was made of the roots and root hairs in upper soil levels for oats, winter rye, and Kentucky bluegrass. The last had by far the most extensive underground development, the average soil core 3 in. in diameter and 6 in. long containing 84,500 roots totaling 1,260 ft. in length and 51,600,000 root hairs totaling 32 miles.

Physiological aspects of sex in angiosperms, W. F. Loehwing (*Bot. Rev., 4 (1938), No. 11, pp. 581–625*).—The main discussions in this review (425 literature references) revolve around the relations of oxidation potential and oxidases, nutrition, temperature, vernalization, and light to flower parts; sex reversal; the effects of animal hormones on plant development, including flower formation and parthenocarpy. The profundity of the change initiated by flowering seems out of all proportion to the brief duration of this phase, and hence its implementation by some specific stimulus rather than by general metabolism seems probable. Once the formative pattern is initiated, it would appear as if development readily ensues, providing nutrition is adequate. The discovery of the hormonic nature of flowering, important in itself, is believed to augur well for further rapid progress in understanding the process. Current research trends seem to indicate that the long-standing gap between genetics and physiology may soon be bridged by studies on the physiology of flowering and the inheritance of the so-called physiological characters.

Airplane collections of sugar-beet pollen, F. C. Meier and E. Artschwager. (U. S. D. A.). (*Science, 88 (1938), No. 2291, pp. 507, 508*).—In the Rio Grande Valley in southern New Mexico, where sugar beets were being grown for seed production in 1938, an airplane flight was made on June 3 with a series of short exposures of agar plates at various altitudes from 1,000 to 5,000 ft. Sugar beet pollen grains, some of which germinated in the plates, were found at all altitudes with the number becoming fewer at 4,000 ft. At the 5,000-ft. level, which corresponds to the so-called "dust horizon," the number seemed appreciably larger than for the other altitudes except the lowest. The plates showed also numerous fungus spores, plant hairs, and pollen from other species of plants, notably *Pinus* spp.

GENETICS

Genetics (*Cur. Sci.* [*India*], *Spec. No.* [*3*] (*1938*), *pp. V+39, pl. 1, figs. 3*).—The present status of genetics is presented in the following papers: Introduction, by E. W. E. Macfarlane (pp. 1–3); The Present Status of the Mutation Theory, by H. J. Muller (pp. 4–15); Cytology of Sex, by O. Winge, (pp. 16–19); Cytogenetics of Species Hybrids, by H. Kihara (pp. 20–23); The Genetics and Cytology of Citrus, by H. B. Frost (pp. 24–27) (Calif. Citrus Expt. Sta.); Phylogeny in the Light of Genetics and Cytology, by E. B. Babcock (pp. 28–30) (Univ. Calif.); Adaptation in the Light of Genetics, by A. F. Shull (pp. 31–33); Genetics of Human Inter-racial Hybrids, by C. B. Davenport (pp. 34–36); and The Future of Genetics, by C. B. Bridges (pp. 37–39).

The biogenetic law and the theory of recapitulation, S. Lebedkin (*Bii͡agenetychny zakon i tėoryi͡a rėkapituli͡at͡syi. Minst: White-Russ. Acad. Sci., 1936, pp. 387; Eng. abs., pp. 333–373, figs.* [*13*]).—A discussion of evolution as depicted in various organs and forms in higher and lower animals.

The breeding of resistant races of crop plants [trans. title], edited by T. Roemer, W. H. Fuchs, and K. Isenbeck (*Kühn Arch., 45 (1938), pp.* [*6*]*+427, pls. 3, figs. 41*).—This monograph (with bibliographies at the ends of subsections) considers the necessity of breeding resistant varieties, the biological bases of breeding for resistance, types of resistance, its inheritance, procedures and methods, and data on specific diseases (pp. 125–419). A tabulation of bacterial and fungus diseases not specifically discussed is included.

Plant disease fungi constantly evolving new types, E. C. Stakman (*Science, 88 (1938), No. 2289, pp. 438, 439*).—This abstract of an address before the National Academy of Sciences refers to the evidence obtained by research, particularly on the rust and smut parasites of plants, that in nature new strains of plant pathogens are constantly being evolved by mutation and hybridization. From a single cell of corn smut 162 distinct strains were produced by mutation in artificial culture within a few months, while more than a thousand types were produced among the progeny from the union of two individual germ cells. Reference is made to the recognition of more than 150 distinct parasitic strains of stem rust of wheat by their effects on 12 varieties of wheat and to the indications that new parasitic strains are continually being produced by hybridization of existing forms on the barberry plant.

Size of seed and other criteria of polyploids, A. F. Blakeslee and H. E. Warmke (*Science, 88 (1938), No. 2289, p. 440*).—As criteria the following were found useful in preliminary separation of the even-balanced 4*n* from normal 2*n* individuals in plants: (1) Larger pollen grains in 4*n* flowers, (2) larger 4*n* seeds, (3) larger stomata, (4) leaves increased in width, thickness, and depth of green color, (5) larger size of floral parts, and (6) shorter, stouter fruits. For odd-balanced types (e. g., 1*n* and 3*n*) criteria (3) to (6) are usable, but the proportion of aborted pollen grains is indicated as a better criterion. The more complex problem of criteria applicable to dioecious plants is discussed.

Failure of chromosome pairing as evidence of secondary diploidy in Zea mays, L. Powers and A. Clark. (U. S. D. A. and Colo. State Col.). (*Jour. Genet., 35 (1937), No. 2, pp. 301–313, fig. 1*).—This paper deals with a test of the goodness of fit between the variability and frequency distribution obtained from data on failure of pairing during diakinesis of divison I (E. S. R., 77, p. 605) and the theoretical variabilities and frequency distributions based on hypotheses developed from theories regarding the phylogeny of the 10 pairs of chromosomes of corn. Analysis of the data showed that the 10 pairs of chromosomes of corn react to forces causing failure of pairing as 7 independent units and that all 10 pairs are involved. The phylogenetic theory that *Z. mays* is a secondary diploid, having originated from a form or forms with 7 pairs of chromosomes, was supported.

Genetic control of gametophyte development in maize, I, II (*Jour. Genet., 34 (1937), No. 1, pp. 57–80; 36 (1938), No. 1, pp. 17–38, fig. 1*).—Two papers are presented.

I. *A gametophyte character in chromosome five,* F. G. Brieger.—A new gametophyte factor in corn, designated ga_2, observed first in material secured from the [New York] Cornell Station (E. S. R., 70, p. 757), is located in chromosome V, between purple-1 and brittle-1. The order of the genes is bt_1–ga_2–pr_1, and their recombination values are bt_1–pr_1, ga_2–pr_1, and bt_1–ga_2. An effect of the alleles Ga_2 ga_2 upon pollen-tube development is to cause three degrees of competition between Ga_2 and ga_2 genotypes, the former being quicker. The degree of elimination depends upon the constitution of the male and female plants. Several new formulas are introduced.

II. *The quarter test,* F. G. Brieger, G. E. Tidbury, and H. P. Tseng.—This paper is based on an assumption that if the ratio of two genetically different types of pollen tubes varies with tube length the growth rates differ and pollen-tube competition is active. A statistical method developed enabled comparison between different parts of the corn ear. The final length of the pollen tubes depends upon the position of the ovule to be fertilized, and if the ear is divided into four zones the distance traveled by pollen tubes will be shortest for ovules in the tip quarter and longest for the butt quarter. The effects of the pair Ga_2 ga_2 were shown. Studies involving *c* (colorless) and *sh* (shrunken) brought forth a third pair Ga_3 ga_3 linked to these genes and about 10 centimorgans to the right of *sh* in chromosome IX. In heterozygous Ga_3 ga_3 about 37 percent of ga_3 pollen tubes functioned in the fourth quarter and in the other quarters 50 percent. Segregation of yellow v. white in White Tirol Flint × Golden Bantam (heterozygous derivative) showed some deficiency of dominant yellow kernels, and variation in dominance of deep v. pale yellow also was shown.

The bearing of the frequencies of X-ray induced interchanges in maize upon the mechanism of their induction, D. G. Catcheside. (Conn. [New Haven] Expt. Sta. et al.). (*Jour. Genet., 36 (1938), No. 2, pp. 321–328*).—Study of X-ray induced interchanges in corn revealed in F_1 progeny from irradiated pollen that individuals with two rings of four chromosomes are slightly more frequent than those with a ring of six chromosomes. Similar relations between the two classes held at different X-ray doses. An explanation is in the contact hypothesis or in the breakage hypothesis if it be supposed that structural rearrangements chiefly follow breaks occurring in nearby positions.

"Laziness" in maize due to abnormal distribution of growth hormone, J. VAN OVERBEEK (*Jour. Heredity, 29 (1938), No. 9, pp. 339–341*).—The auxin concentration in horizontal stems of "lazy" and standard corn was determined by ether extraction. In standard plants more auxin was found in the lower than in the upper halves of the stem, while the reverse was true for the abnormal stems. This is believed to provide a logical explanation of the prostrate growth habit of the lazy plants. It thus appears evident that the lazy gene interferes with auxin distribution in the stems which normally occurs under the influence of gravity.

The genetics of lintlessness in Asiatic cottons, J. B. HUTCHINSON and P. D. GADKARI (*Jour. Genet., 35 (1937), No. 2, pp. 161–175*).—Describing seven types of lintless occurring in Asiatic cottons (E. S. R., 71, p. 179), the authors show that at least four independent genes are involved. Two of the genes are complementary for glabrous lintless and two complementary for hairy lintless. No satisfactory evidence of linkage was found for the lintless genes.

A preliminary report on okra breeding in Louisiana, J. C. MILLER and W. F. WILSON. (La. State Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 551–553*).—From among a number of individual plant selections made in 1931 from established varieties, there was derived the Louisiana Velvet with pods practically free of spines. Crosses in 1935 among selected strains showed an unusual type of blending in hybrids of inbred strains with angular and round pods. The fruit of the F_1 generation was round, whereas among 1,448 F_2 plants only 98 had round pods, suggesting a 15 : 1 ratio. Crosses between tall and dwarf varieties yielded all intermediates in the F_1.

Abnormalities in the seedlings of certain apple stocks as associated with triploid chromosome numbers, S. W. EDGECOMBE. (Iowa State Col.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 402–408*).—Observing that open-pollinated seedlings of Hibernal and Virginia Crab produced weak seedlings, while certain less vigorous varieties produced strong seedlings, cytological studies were made of the flowers of different varieties. The results indicated that Hibernal, Virginia Crab, and Stayman are triploid in nature, have irregular reduction divisions, and produce weak pollen, while less vigorous varieties, such as Whitney, are diploid, with regular reduction and strong pollen. Further evidence of the abnormal chromosomal structure of Hibernal and Virginia Crab was shown in the very poor results of pollination involving these varieties.

Factors affecting the rate and course of development of the female gametophyte in apple varieties, F. S. HOWLETT. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 105–110*).—Seeking an explanation of factors underlying differential capacity in fruit setting of apple varieties within the diploid and triploid groups, the author examined the flowers of seven diploid and five triploid kinds. One of the most significant differences between diploids and triploids was the amount of degeneration occurring during the development of the female gametophyte. Subsequent to the megaspore stage there was noted in the triploids a considerable number of degenerated female gametophytes. These were rare in the diploids except in Delicious. Baldwin showed the least degeneration of the triploids. In Arkansas (triploid) there was observed three times as much degeneration in the terminal as in the lateral flowers of a cluster. The triploid varieties were much slower in the rate of development of the female gametophyte. Practically all diploid varieties attained the eight-nucleate stage at the time the petals unfolded. At the same time, the triploids had four nucleuses or less. Observations on Stayman flowers from a nitrogen-supplied and a nitrogen-deficient tree showed that nitrogen deficiency had increased the amount of disintegration of embryo sacs as well as reduced the rate of development of the others.

Progress in peach breeding, M. A. Blake. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 49–53*).—Data are presented on the inheritance of color in crosses between red- and green-leafed types and on the inheritance of the time of ripening in crosses between J. H. Hale and other varieties. Some of the red-leafed selections were homozygous for red and others heterozygous. The earlier finding that the soft-ripe date of seedlings is generally intermediate between the soft-ripe date of the parents was not borne out consistently in the later studies.

Inheritance of thorns in blackberries, A. E. Stene and T. E. Odland. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 54–56*).—As reported in this second paper (E. S. R., 76, p. 631), the selfing of Austin Thornless, completely thornless, resulted in 22 thorny and 52 thornless plants, indicating that thornlessness in Austin is dominant and heterozygous. Santa Rosa, the only other completely thornless variety so far located, failed to set fruit on selfing. A limited number of cross-pollinations were successful, but the seedlings were too small for analysis. Crosses in which Cory Thornless, Thornless Youngberry, and *Rubus canadensis* were used resulted in plants as thorny or more so than the so-called thornless parents.

A genetic study of variations in floral morphology and function in cultivated forms of Vitis, G. D. Oberle (*New York State Sta. Tech. Bul. 250 (1938), pp. 63*).—From studies of varieties and seedlings of known parentage and of the extensive records accumulated by the station over many years, the author concludes that grape flowers are of three clearly defined types—functionally hermaphroditic, functionally pistillate, and functionally staminate. All types were morphologically hermaphroditic in that flowers of each of the three classes had full stamens and pistils. Unisexualism resulted from the abortion of either the male or female elements in the normal bisexual type. Abortion occurs during a late stage in the development of the sexual elements and always after meiosis. American species of grapes were entirely dioecious in that only staminate and pistillate individuals occurred. *V. vinifera*, on the other hand, had functionally hermaphroditic as well as functionally pistillate and staminate forms. The different floral types are discussed and genetical formulas assigned.

Crosses involving the various floral types exhibited simple Mendelian ratios. A few hermaphroditic individuals were found homozygous for hermaphroditism in that when selfed or crossed with other hermaphroditic or pistillate individuals the progeny were all hermaphroditic. Staminate forms appeared only in progeny from crosses involving a staminate parent. Functional hermaphroditism is considered the primary floral type in *Vitis*, and unisexualism is deemed phylogenetically younger and derived from the bisexual condition. A theory is offered which accounts for the evolution of dioecism from functional hermaphroditism.

A genetic study of some qualitative and quantitative characters of the genus Capsicum, J. C. Miller and Z. M. Fineman. (La. State Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 544–550, fig. 1*).—As a result of direct and reciprocal crosses made between Tabasco, Sport, Cayenne, and Bell, the authors conclude that the various varieties of *Capsicum frutescens* grown in Louisiana are mutually interfertile. Natural crossing occurred when varieties were planted closely. Fruit position, type of fruit base, type of calyx, and flavor of the ovary wall were inherited on a single-factorial basis. The mild flavor of the ovary wall was dominant over pungent flavor. A cross-over of 4.7 percent was observed between type of fruit base and type of calyx.

Induction by fast neutrons of mutations in Antirrhinum and Myosotis, R. M. CHATTERS (*Science, 88 (1938), No. 2280, pp. 241, 242*).—Some plants from dry seeds exposed to stray neutrons from the cyclotron gave rise to flowers differing in morphology and color from their controls.

The application of genetics to animal breeding, H. F. KRALLINGER (*Angewandte Vererbungslehre für Tierzüchter. Stuttgart: Eugen Ulmer, [1937], pp. 110, figs. 53*).—The inheritance is described of various morphological, physiological, and production characters in horses, cattle, sheep, swine, rabbits, and poultry, including a discussion of inbreeding and crossbreeding.

Inheritance of biochemical characters in animals in connection with growth, III, IV, V. I. PATRUSHEV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 19 (1938), No. 4, pp. 285–290, 291–296, figs. 2*).—Two further papers in this series (E. S. R., 78, p. 179) are reported.

III. *On some indices of the blood composition of the hybrids between Bactrian camels and dromedaries in connection with heterosis.*—Study of the blood composition of 28 nars (hybrids between Bactrian camels and dromedaries), 20 dromedaries, and 52 Bactrian camels showed that the volume of the formed elements and the specific gravity of the blood and the glutathione content were higher in the hybrids than in the parental stocks. These changes in the blood composition were associated with heterosis in nars. The resistance of the erythrocytes to hemolysis and the catalase content of the blood were highest in the Bactrian camels.

IV. *Differences in composition of blood in horses, asses, and mules.*—Studies were made of changes in the blood composition of mules, asses, and horses with age. Young males were found to lag behind females in growth and possess lower indexes of specific gravity, dry residue, and total glutathione content of the blood than females. Young asses and mules showed a greater drop in the blood indexes at from 1.5 to 2.5 yr. than horses. The heterosis of mules was attributed to the higher volume of the formed elements, the dry residue of the blood, and the higher glutathione content in the hybrid animal than in the parental types.

The use of records in evaluating the inheritance of cows and in the proving of bulls, L. COPELAND (*Jour. Dairy Sci., 21 (1938), No. 10, pp. 651–660*).—Correlations above 0.9 were obtained between the highest yearly record and the average of 5 records for 197 cows having that many records in the Register of Merit of Jersey cattle and 166 cows with 5 herd-test lactations. Records following disease, drought, etc., did not give a true picture of a cow's producing ability. Disease, culling, feeding, management, etc., may be important factors in lifetime production. Correlation of daughters' with dams' production was not good whether it was calculated from the dams' highest or average production. The highest record is suggested as the best indication of an animal's production ability.

New data on the chromosome number in yak (Poëphagus grunniens L.), A. I. ZUITIN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 19 (1938), No. 3, pp. 201, 202, figs. 3*).—Further study (E. S. R., 76, p. 774) of the spermatogonial metaphase from yak tests showed the diploid chromosome number to be 60, which is thus equal to the number in cattle. The sex chromosomes X and Y were usually situated at the periphery of the equatorial plate.

Succession in birthcoat kemp follicles, F. W. Dry (*Nature* [*London*], *141* (*1938*), *No. 3577, p. 921*).—Preliminary breeding experiments point to the importance of genetic factors in determining differences in the sequence of kemp fibers in sheep.

[The genetical and mechanical properties of the sex-chromosomes.—III], Chromosome behaviour in the male ferret and mole during anoestrus, P. C. Koller (*Roy. Soc.* [*London*], *Proc., Ser. B, 121* (*1936*), *No. 822, pp. 192–206, pls. 2, figs. 11*).—Continuing these studies (E. S. R., 77, p. 464), consistent irregularities in the cytology of the testes during the nonbreeding season resulting in degeneration of the spermatocytes and the failure of spermatids and spermatozoa to differentiate were noted in the ferret and mole. The diploid chromosome numbers in the ferret were found to be 34 and in the mole 38. The Y chromosome was smaller than the X chromosome in both animals.

The genetical and mechanical properties of the sex-chromosomes.—IV, The golden hamster, P. C. Koller (*Jour. Genet., 36* (*1938*), *No. 2, pp. 177–195, pl. 1, figs. 12*).—The chromosome count of the male golden hamster (*Cricetus auratus*) was found to be 38. Sex chromosomes, although the largest of the chromosome complement, were unpaired or failed to form chiasmata in about 8 percent of the primary spermatocytes. Chromosome behavior during mitosis and meiosis is described from testis material.

Breeding for egg production, L. W. Taylor and I. M. Lerner (*California Sta. Bul. 626* (*1938*), *pp. 48, figs. 4*).—A review is given of the present knowledge of egg production characters, including factors for maturity; winter, spring, and summer pauses and broodiness; and persistency and rate of production. The influence and heredity of conditions affecting viability, including longevity and disease resistance, are discussed. A summary is given of the inheritance of quality factors, including egg size, shape, and color; characteristics of the shell and albumen; and hatchability. The merits of different methods of breeding and the success attained in improving production and reducing pathological conditions in the station flock over a period of 4 yr. are pointed out.

Composition of blood in camels in relation to the working ability of these animals, H. F. Kushner (*Compt. Rend* (*Dok.*) *Acad. Sci. U. R. S. S., n. ser., 18* (*1938*), *No. 9, pp. 681–684*).—As in the case of horses, cattle, and sheep, where greater working ability is associated with higher oxidizing power of the blood and a greater weight and development,[2] it was found that the oxidizing power of the blood of nars, which are more vigorous than the parental species of Bactrians and dromedaries, was higher as determined by the numbers of red cells, hemoglobin, and blood alkalinity. The weights were also greater and growth was more rapid in camels with higher hemoglobin contents of the blood.

The blood composition in yaks, in cattle, and in their hybrids in connection with the heterosis of the hybrids, H. F. Kushner (*Compt. Rend.* (*Dok.*) *Acad. Sci. U. R. S. S., n. ser., 19* (*1938*), *No. 3, pp. 185–188*).—Blood analyses of yaks, cattle, and hybrids between them in the Oirat Zootechnical Station showed that the hemoglobin content, blood alkalinity, and diameter of the red cells increased, whereas the number of red cells decreased, with age. Comparisons of the adult yak and cattle with hybrids showed that the hybrids greatly exceeded the two parental species in the basic indexes responsible for the oxidizing power, such as hemoglobin content, number of erythrocytes, and alkalinity. The better oxidizing capacity of the blood causes a more intense metabolism and more rapid growth. Similar results were obtained in studies, noted above, of hybrids of dromedaries and Bactrians and in mules.

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[2] Izv. Akad. Nauk S. S. S. R. (Bul. Acad. Sci. U. R. S. S.), Ser. Biol., 1937, No. 2, pp. 469–483, fig. 1; Eng. abs., pp. 480–483.

Inadequacies of estradiol substitution in ovariectomized albino rats, H. LAUSON, C. G. HELLER, and E. L. SEVRINGHAUS. (Univ. Wis.). (*Endocrinology, 23 (1938), No. 4, pp. 479–484*).—It was impossible to replace the normal ovarian function of castrated rats by the injection of oestradiol daily. There was pituitary hypertrophy and increased gonadotropic potency above normal levels.

The effects of estrogenic hormone on the sex cycles of normal rats, J. K. DONAHUE (*Endocrinology, 23 (1938), No. 4, pp. 521–523*).—Functional corpora lutea were continued for not over 20 days in adult female rats by daily injection of doses of from 50 to 500 International Units of theelin. Evidently, no actual stimulation of the luteinizing hormone production by the hypophysis was effected.

The excretion and fate of androgens.—II, Concerning the conversion of androgens to estrogens, C. D. KOCKAKIAN (*Endocrinology, 23 (1938), No. 4, pp. 463–467, fig. 1*).—Continuing these studies,[3] failure to demonstrate an increase in oestrogens in the urine of one normal and four castrate dogs to which doses of various androgens were administered subcutaneously is taken to indicate the inability of the male animal to convert androgens into oestrogens.

The effect of anterior pituitary extracts on established lactation in the cow, S. J. FOLLEY and F. G. YOUNG (*Roy. Soc. [London], Proc., Ser. B, 126 (1938), No. 842, pp. 45–76, figs. 12*).—The action of several anterior lobe extracts of tested prolactin and thyrotropic, glycotropic, and diabetogenic hormone contents on the yield and composition of milk from 33 Dairy Shorthorn cows injected during the declining stages of lactation was studied at the National Institute for Research in Dairying, Reading, England. In general agreement with the results of Azimov and Krouze (E. S. R., 78, p. 616), single injections of a crude saline extract or of prolactin or thyrotropic preparations of fresh ox anterior pituitary were found to increase milk yield about 10 percent for 5 or 6 days. Differing from the above authors' results, a decrease, although small, in the nitrogenous, nonfatty solids was observed, but no other changes in composition seemed significant.

Differences in the pigeon crop gland proliferation and in lactogenic activity in the cow suggested that anterior lobe hormones other than prolactin stimulated milk secretion in the cow. A single injection of one prolactin preparation had no lactogenic effect but induced a substantial and prolonged increase in yield when administered daily.

A surprising parallelism between the lactogenic activity and the glycotropic activity of the preparations studied was noted. Suggestion is made that the blood sugar level may be a limiting factor in lactation. The value of the extra milk produced from fresh anterior pituitary extracts was estimated to be greater than the cost of the preparations.

Selective neutralization of the luteinizing activity of gonadotrophic extracts of pituitary by anti-sera, I. W. ROWLANDS (*Roy. Soc. [London], Proc., Ser. B, 126 (1938), No. 842, pp. 76–87, pls. 3, figs. 3*).—In studies at the National Institute for Medical Research, London, the ovarian response of immature rats to the administration of gonadotropic extracts from horse pituitaries was modified by the simultaneous administration of serum from rabbits sensitized to the luteinizing hormone by daily injection for 3 or 5 mo. of a pyridine extract of ox pituitary. The extracts of the horse pituitaries alone produced luteinization, but with the rabbit antiserum the ovarian development was limited to follicle stimulation with the absence of corpora lutea. Larger doses of the antiserum tended to inhibit progressively follicular stimulation and the ovarian weight response. It seems evident that the pituitary extracts contain separate follicle-stimulating and luteinizing hormones.

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[3] Endocrinology, 21 (1937), No. 1, pp. 60–66, fig. 1.

The physiological response of ocular transplants of the seminal vesicle in female rabbits, R. H. Melchionna and S. Flanders (*Endocrinology, 23 (1938), No. 4, pp. 468–475, figs. 6*).—The enlargement of vesicular transplants in the ocular chamber of male and female rabbits as a result of injections of either androgens or oestrogens demonstrated that the seminal vesicle is a true ambisexual tissue.

FIELD CROPS

Trend studies in relation to the analysis of yield data from rotation experiments, K. H. W. Klages. (Idaho Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 7, pp. 624–631, figs. 2*).—Trend relationships of yield data, 1915–37, of 10 crop rotation systems at Moscow are presented to show that yield data of long time experiments and especially of crop rotations may be supplemented to advantage by trend studies. While straight line trends are not applicable to all compilations, where they do fit the data they provide a good index of the general or average slope of the trend line of yield tests extending over a period which can be used to advantage in analysis and presentation of results. Where the data exhibit variable trends for different periods of the experiment, curvilinear trends must be employed to formulate the trend relationships. In the crop-rotation data analyzed the closeness of fit of yield data to trend lines was not materially better for parabola than for straight line trends.

[Field crops investigations in Georgia]. (Partly coop. U. S. D. A., Ga. Coastal Plain Expt. Sta, et al.). (*Georgia Sta. Rpt. 1938, pp. 16–19, 20–22, 23–47, 55–58, 59, 62, 63, 90, 93, 94, figs. 9*).—Continued agronomic research (E. S. R., 78, p. 619) at the station and Mountain Substation, reviewed briefly, included breeding work with wheat, oats, cotton, soybeans, and peanuts; variety trials with cotton, flax, oats, soybeans, peanuts, and potatoes; effect of source of seed and variety on germination of cottonseed; maintaining purity of sea-island cotton; cotton nutritional studies dealing with glutamine nitrogen contents and leaf areas of plants, manganese requirements, and effects of superphosphate and dolomitic limestone; rapid chemical tests for soil nutrients available to crops; fertilizer formulas for peanuts; time of cutting soybeans for hay; seeding and fertilizer tests with fiber and seed flax and a date of harvesting fiber flax experiment; production of sirup from sorgo varieties; and pasture research concerned with fertilizers and limestone for Bermuda grass production, phosphorus and limestone requirement of some clovers on Bermuda sod, sources of nitrogen for Bermuda grass-lespedeza pasture, winter clovers, grasses, and mixtures on Bermuda-lespedeza sod, introduction, improvement, and nutritional value of pasture plants, and soil moisture and temperatures under pasture conditions.

[Field crops research in Puerto Rico in 1937]. (Partly coop. U. S. D. A., P. R. Col. Sta., et al.). (*Puerto Rico Sta. Rpt. 1937, pp. 37–40, 42–46, 49–56, 75, 76, figs. 8*).—Progress is reported from breeding work and studies of flowering and fruiting with sweetpotatoes; physiological, storage, and propagation studies with yams; and comparative tests of sugarcane varieties.

Field studies of alfalfa inoculation, E. C. Stacey (*Sci. Agr., 18 (1938), No. 5, pp. 277–282, figs. 2*).—Field tests at Beaverlodge, Ont., 1928–35, confirmed results of others showing that pronounced differences exist in the vigor, adaptability, and beneficial effects of various stocks of nodule bacteria and suggest their differentiation for specific conditions. Soil-seed inoculation by the glue method gave much better results in some cases than culture inoculation. Seed inoculation several days before planting may be satisfactory, depending somewhat on storage and other conditions. Ample moisture and good cultural conditions favored the securing and spreading of effective inoculation.

The amylases of different barley varieties, C. H. HILLS and C. H. BAILEY. (Minn. Expt. Sta.). (*Cereal Chem., 15 (1938), No. 3, pp. 351–362*).—Samples of barley varieties grown in 1936, an abnormally dry year, were much higher in protein content and diastatic activity of barley and malt and lower in 1,000-kernel weight than those grown in 1935, a year with better growing conditions. Barley from the 1936 crop was lacking in α-amylase, but most samples grown in 1935 contained appreciable quantities. Positive correlations were observed between the total β-amylase activity of barley and of green malt and between total α-amylase and total β-amylase of green malt. Odessa, Manchuria, and Oderbrucker were high as to both diastatic functions, and Wisconsin No. 38, Spartan, Minnesota No. 462, and Glabron were low. Trebi was highest in β-amylase but deficient in α-amylase activity. Barley germination resulted in a relatively large increase in free (water-soluble β-amylase activity, but the increase in total β-amylase activity was only from 25 to 29 percent. The concentration of total β-amylase did not change on germination, and the observed increase in total β-amylase activity was found due to increase in α-amylase activity.

Fertilizers for white pea beans, C. E. MILLAR, R. L. COOK, and J. F. DAVIS. (Coop. U. S. D. A.). (*Michigan Sta. Spec. Bul. 296 (1938), pp. 45, figs. 9*).—Fertilizer experiments with field beans were conducted, 1921–37, on 57 farms in 18 counties in east-central Michigan.

Application of 300 lb. of 4–16–4 fertilizer in bands close to but separate from the seed caused significant yield increases, often large enough to more than pay for the fertilizer. Broadcasted fertilizer resulted in no increases in yield or increases which were small and unprofitable, a condition not changed by plowing under the fertilizer. Applying 75 lb. of fertilizer with the seed did not produce increases in yield and resulted in poorer germination and stand. Advantages of fertilizers in higher yield may largely be nullified by adverse weather, especially at blooming, even though vine growth may have been increased considerably by fertilizer.

Application of fertilizer in a single band from 1.5 to 1.75 in. below the seed and in bands 1.5 in. out from the seed were the most promising of the band placement methods tested. A band on one side of the seed served as well as bands on both sides, and bands placed deeper than the seed were more satisfactory than on a level with the seed. Use of 0–16–8 fertilizer gave better results as to yield and economy than of 0–16–0 or 4–16–8, and applications exceeding 300 lb. per acre were not economical. Increases of 1 bu. or more over unfertilized plats in the same fields were made in 79.4 percent of the cases in which fertilizer was applied in bands under or beside the seed and in only 56.6 percent of the plats on which fertilizer was applied by the common or other methods.

Plowing under sweetclover green manure gave good results on two different soils in 1935, in harmony with the view that fertilizer may best be applied on the green manure preceding beans rather than to the beans directly.

Determining the effectiveness of commercial cultures of nodule-forming bacteria on the yield of pink beans (Phaseolus vulgaris), blackeye beans

(Vigna sinensis), and Wilbur beans (Phaseolus lunatus), W. W. Mackie. (Calif. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 6, pp. 543, 544*).—Yolo silt loam at Davis appeared to be well supplied with nodule-forming bacteria as effective as those in commercial cultures for varieties of the three species of beans.

Cotton, H. B. Brown (*New York and London: McGraw-Hill Book Co., 1938, 2. ed., pp. XIII+592, [pl. 1], figs. 140*).—A revision and enlargement of the book noted earlier (E. S. R., 57, p. 227).

Fertilizing constituents of cotton burs or cotton bur ashes and their effect on crop yields, H. J. Harper, H. A. Daniel, and G. W. Volk. (Okla. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 10, pp. 827–832*).—Effects on the yield of seed cotton of applying cotton burs and their ashes to Kirkland soil were studied, 1926–37. Three tons of burs applied at 3-yr. intervals either plowed or disked into the soil gave as good returns as 6 tons on adjacent plats treated similarly. The average increase over the checks was 189 lb. per acre when 3 tons was plowed under and 166 lb. when disked into the soil. The average gain from 6 tons disked in was 170 lb. of seed cotton. Ashes from either 3 or 6 tons of burs produced only about one-half as great an increase in yield as did the burs.

Cotton burs collected from 22 counties in Oklahoma were found to contain averages of ash 8.73, nitrogen 1.04, phosphorus 0.1, calcium 0.65, potassium 3.39, and magnesium 0.25 percent on a moisture-free basis. The average quantities of different oxides found in cotton bur ashes were phosphoric acid (P_2O_5) 2.68, calcium oxide 10.41, potassium oxide 45.15, and magnesium oxide 4.76 percent. See also an earlier note by Murphy (E. S. R., 74, p. 629).

Relation between fiber length and maturity in cotton, R. S. Hawkins. (Ariz. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 8, pp. 583–587, figs. 2*).—Examination of samples of Acala cotton from 31 locations in the upper Gila Valley in Arizona showed that the longest and the shortest fibers, in a given lot of cotton, are less mature than fibers of intermediate lengths. Fibers toward the top of the range in intermediate lengths slightly surpassed in maturity those toward the bottom. Cotton breeders who select progenies with greater proportions of the longer intermediate fibers evidently select toward improvement in fiber maturity. See also an earlier note (E. S. R., 63, p. 528).

Stimulation of kudzu cuttings, M. C. Myers, R. A. Bowden, and F. E. Hardisty. (Univ. Ga. and U. S. D. A.). (*Science, 88 (1938), No. 2277, p. 167*).—Rooted cuttings of kudzu treated with several commercial hormone products showed an increase in number and size of roots over the untreated cuttings. Potassium permanganate appeared superior to any hormone product tested for kudzu in percentage of strike and size and number of roots developed.

Mustards used as cover crops, W. L. Goss (*Calif. Dept. Agr. Bul., 25 (1936), No. 3, pp. 341–348, figs. 4*).—Plant, pods, and seeds of the cultivated white (*Brassica alba*), black (*B. nigra*), and Indian mustard (*B. juncea*), and a wild form of black mustard, charlock (*B. arvensis*), and common yellow mustard (*B. campestris*) are described for growers intending to use mustard as a cover crop.

Mustards as cover crops; and need of care in purchasing of the seeds, E. R. Parker. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 23 (1938), No. 11, pp. 463, 464, fig. 1*).—*Brassica alba* and the "cultivated" form of *B. nigra* are indicated for planting as suggested.

Nineteenth annual report of the Nebraska Potato Improvement Association, edited by H. O. Werner (*Nebr. Potato Impr. Assoc. Ann. Rpt., 19 (1938), pp. 70, figs. 2*).—The papers presented at the 1938 meeting at Gering included Some Soil Fertility Problems of the Potato Growers of the North Platte Valley, by E. S. Lyons (pp. 13–19), and The United States Grades and Inspection Relative to Marketing of Fruits and Vegetables, by N. D. Sanborn (pp. 45–52) (both U. S. D. A.); and Are There Better Varieties of Potatoes for Western Nebraska? (pp. 29–33) and The 1937 Potato Season (pp. 56–62), both by H. O. Werner, and Consumer Preferences for Potatoes, by L. F. Garey (pp. 38–42) (all Nebr.).

[Potato research in Ohio and New York] (*Ohio Veg. Growers Assoc. Proc., 23 (1938), pp. 90–102, 105–110, 112, 114, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150*).—These papers include Experiments With Fall-Crop Cobblers Grown for Seed (pp. 90–95) and New Varieties of Potatoes Introduced by the U. S. Department of Agriculture (pp. 101, 102), both by J. Bushnell, and Ohio Appraises its Potato Industry.—A Progress Report, by C. W. Hauck (pp. 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148) (all Ohio Expt. Sta.); Grade Analysis of Potatoes on the Cleveland and Rochester Markets (pp. 95–100) and Results of Our Newer Potato Investigations (pp. 105–110, 112, 114), both by E. V. Hardenburg ([N. Y.] Cornell); What's Ahead in Potato Production? by G. W. Miller (pp. 124, 126, 128); and Storage of Seed for Planting Seed Plots, by H. Leimbach (p. 150).

Recent developments in potato breeding: Review of literature, C. F. Clark. (U. S. D. A.). (*Amer. Potato Jour., 15 (1938), No. 1, pp. 16–22, 24, 26*).—Potato improvement research reviewed, largely published in 1937, covers 29 titles.

The Earlaine potato, a new early variety, C. F. Clark and F. J. Stevenson. (Coop. Maine Expt. Sta.). (*U. S. Dept. Agr. Circ. 493 (1938), pp. 6, fig. 1*).—The Earlaine (Early Maine) potato originated from a cross between Irish Cobbler and a seedling variety, No. 43055, the ancestry of which includes Irish Cobbler, Triumph, and U. S. D. A. seedling No. 24642. It is a rapidly growing, early potato maturing at the same time as Irish Cobbler and Triumph in northern Maine and is very highly resistant to mild mosaic under field conditions. The tubers are round, regular in outline, with medium shallow eyes and of an ivory-yellow color, classed as white by the trade; fair in cooking quality, and excellent in keeping quality. The adaptation is somewhat limited, being confined chiefly to areas with conditions similar to northern Maine and in certain counties of New York State, where it produces good crops.

Chemical estimations of the weekly nutrient level of a potato crop, R. L. Carolus. (Va. Truck Expt. Sta.). (*Amer. Potato Jour., 14 (1937), No. 5, pp. 141–153, figs. 8*).—Potatoes have a large total requirement of nitrogen, phosphorus, potassium, magnesium, and calcium, the maximum nutrient requirement being from 50 to 80 days after planting. In 1936 during this 30-day period, one acre of potatoes absorbed nitrogen at the rate of 1.66 lb. daily, phosphorus 0.3, potash 3.33, and magnesia 0.3 lb. daily. Conclusions were that tests on potato stems at critical periods or in diagnosing deficiency symptoms under conditions similar to those of the experiment should, under optimum growing conditions, indicate a minimum soluble content of nitrogen of 700–800 p. p. m. and minimum contents of soluble phosphorus of 150 and 60 p. p. m. at the beginning and close of the season, respectively, of potash 2,200 and 4,500, of magnesia 275 and 800, and of lime 600 and 1,400 p. p. m., respectively.

Potato fertilization in Aroostook County, Maine, J. A. Chucka. (Maine Expt. Sta.). (*Veg. Growers Assoc. Amer. Ann. Rpt., 1937, pp. 176–184*).—The kind and amount of fertilizer, method of application, and maintenance of soil conditions favorable to efficient utilization of fertilizer applied, recommended for potatoes in Aroostook County, are discussed from results of station experiments.

Green manure crops for potatoes, O. Smith. (Cornell Univ.). (*Amer. Potato Jour., 15 (1938), No. 8, pp. 219–225*).—Preliminary results are reported from experiments to determine the best green manures and cover crops and methods of growing and incorporating them in the soil for highest yields and quality of potatoes, the feasibility of adding various forms of nitrogen to green manures previous to plowing under in the spring, and of growing a combination of green manure crops 1 yr. to furnish a maximum amount of dry matter and then following with three successive potato crops.

Potato tuber bruising in the Cleveland and Rochester markets, E. V. Hardenburg. (Cornell Univ.). (*Amer. Potato Jour., 15 (1938), No. 8, pp. 213–219*).—Retail store samples of potatoes in Cleveland and Rochester averaged 6.11 percent damage and 2.21 percent serious damage from tuber bruising, which represented 38.6 percent of total damage from all causes. Bruising damage averaged considerably higher in chain groceries than in independent groceries and fruit and vegetable stores, and was least in potatoes used by institutions such as hotels, cafeterias, restaurants, and hospitals. Green Mountains showed a much greater percentage of injury than other varieties. White Rurals seemed to resist bruising more than Russet Rurals. The 30-lb. samples analyzed at the car and later in the retail market increased more than threefold in total bruising damage from handling, the total percentage by weight being 12.69 percent. Green Mountain was least resistant, while Chippewa and Katahdin showed even smaller increases in damage than White Rurals from bruising.

Response of sorghum to high and low soil moisture, V. P. Rao. (Univ. Nebr.). (*Bul. Torrey Bot. Club, 65 (1938), No. 6, pp. 413–420, figs. 2*).—Sorghum was grown for 42 days in fertile loess soils with 33 and 14.8 percent moisture, the wilting hygroscopic coefficient being about 13 percent. Plants grown in moist soil were one-fourth taller and heavier and had one-third more photosynthetic area than those in dry soil. In moist soil the dried tops were twice as heavy as the roots, but the weights were the same in dry soil. Plants in dry soil had more and longer roots and nearly three times the root area of those in moist soil. Well developed secondary roots were produced under both treatments. Moist soil was more favorable to development of primary roots, but tertiaries were better in dry soil. Volumes of root systems in the moist and dry soils averaged 1.25 and 1.84 cc, respectively, and in the latter root hairs were more abundant but shorter.

"Weak neck" in sorghum, A. F. Swanson. (U. S. D. A. and Kans. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 9, pp. 720–724, fig. 1*).—Weak peduncles in sorghum, termed weak neck, characterized by disintegration of affected tissues with consequent weakening so that heads break over, most often at the base of the peduncle, have been observed in many selections, particularly from milo-kafir crosses. This character is undesirable, for dwarf varieties adapted to combine harvesting must have sturdy stalks and peduncles to prevent the heads from breaking over. Sorgos and strains of Blackhull kafir exhibit high resistance to weak neck, while milo and milo derivatives having milo characteristics often show high susceptibility. Late planting on a well-prepared seedbed tends to reduce the prevalence of weak neck in susceptible varieties. Inheritance studies suggest that more complete control may be expected from breeding.

Hydrocyanic acid content of different parts of the sorghum plant, J. H. Martin, J. F. Couch, and R. R. Briese. (U. S. D. A.). (*Jour. Amer. Soc.

Agron., 30 (1938), No. 9, pp. 725–734, fig. 1).—The hydrocyanic acid (HCN) content of sorghum leaves, as determined on material grown in Texas, New Mexico, Colorado, and Virginia in 1936 and 1937, was from 3 to 25 times that of the corresponding stalks of plants that had reached the boot stage, whereas heads and leaf sheaths were low in HCN. The upper (younger) leaves contained more HCN than lower leaves. The proximal half of the leaf was higher in HCN than the distal (older) half, and the HCN content of leaf blades was 6 times that of midribs. In stalk internodes the HCN content decreased progressively downward so that the lower (older) internodes contained only small quantities. Axillary (side) branches were much higher in HCN than the older main stalks, and tillers usually were higher in HCN than the older main stalks of the same plants.

Effect of strains of nodule bacteria and lime on the response of soybeans to artificial inoculation, C. F. BRISCOE and W. B. ANDREWS. (Miss. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938). No. 9, pp. 711–719*).—Field studies on limed and unlimed Lufkin clay dealt with responses of Mammoth Yellow and Laredo soybeans to good and poor strains of soybean nodule bacteria and of Mammoth Yellow to 16 strains of good soybean nodule bacteria and 2 strains of cowpea root nodule bacteria from different sections of the country. Variations in the response of these 2 soybeans to strains of nodule bacteria seemed as great as differences between the soybean and cowpea cross-inoculation group. Indications were that strains of soybean nodule bacteria isolated locally are more efficient than strains from different climates. Lime requirements of strains of soybean Rhizobia varied considerably.

The sugar beet industry of Nebraska, E. S. ANDERSON (*Nebr. Univ., Conserv. and Survey Div., Conserv. Dept. Bul. 9 (1937), 2. ed., pp. 119, figs. 35*).—This practical manual treats of the development and status of the sugar beet industry in Nebraska, the United States, and the world; the plant and its environmental, cultural, and harvest requirements; diseases and insect pests; the manufacture of beet sugar and use of byproducts; and other factors and problems involved in the production of the crop and marketing of sugar.

Sweetpotato plant production in Mississippi, W. S. ANDERSON (*Mississippi Sta. Bul. 325 (1938), pp. 1+10, figs. 4*).—Essentials to success in producing sweetpotato plants, considered briefly, include good seed stock, suitable propagating beds and bedding medium, appropriate bedding methods, and proper pulling and care of plants. Details of hotbed construction are included.

Experiments at Laurel, 1935–37, showed that more plants were produced by large seed (roots 2–3.5 in. thick) than by small seed (1–1.5 in. thick), the plants were no larger, and small seed produced more plants per bushel earlier and for the entire season. Carefully handled seed stock (E. S. R., 76, p. 786) sprout earlier and are superior in other ways to roots given ordinary care.

Sweetpotato propagation and transplanting studies, J. H. BEATTIE, V. R. BOSWELL, and J. D. MCCOWN. (Coop. S. C. Expt. Sta.). (*U. S. Dept. Agr. Circ. 502 (1938), pp. 16*).—The main observations in these studies essentially have been noted from other sources (E. S. R., 72, p. 612; 79, p. 475).

Effect of potash on grade, shape, and yield of certain varieties of sweetpotatoes grown in South Carolina, V. R. BOSWELL, J. H. BEATTIE, and J. D. MCCOWN. (Coop. S. C. Expt. Sta.). (*U. S. Dept. Agr. Circ. 498 (1938), pp. 24*).—Fertilizer studies on Orangeburg sandy loam and Norfolk sandy loam, 1929–35, near Florence, S. C. (E. S. R., 78, p. 42), showed only relatively small increases in yield of sweetpotatoes with increasing amounts of potash in 500-lb. per acre applications of mixtures also containing nitrogen 3 percent and phosphoric acid 8 percent. They varied markedly with results obtained by others in New Jersey, Virginia, Maryland, Georgia, and Florida, but agreed rather closely with results obtained in North Carolina, Mississippi, and Louisiana. Indications were that marked effects of potash upon shape of sweetpotatoes will be found only when supplied under conditions of relatively serious potash deficiency. The shape of Porto Rico was influenced by potash slightly more than Nancy Hall or Big Stem Jersey, but not to an important degree.

Time of cutting timothy: Effect on the proportion of leaf blades, leaf sheaths, stems, and heads and on their crude protein, ether extract, and crude fiber contents, W. H. Hosterman and W. L. Hall. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 7, pp. 564–568, fig. 1*).—The percentage distribution and composition are shown at five stages of maturity for the several vegetative parts of the timothy plant used in the production of hay. "The results of this investigation indicate that the percentage of leaf blades and heads should be considered in determining the quality and feed value of timothy and perhaps other grass hays, since the protein in the leaf blades decreased with maturity while the protein in the heads increased."

Italian tobacco types, U. Rossi (*I Tabacchi greggi italiani. Roma: Ente Naz. Tabacco, 1937, pp. 127+[2], [pls. 43, figs. 4]*).—The plants and cured leaf of a number of important varieties of tobacco, grown more or less extensively in Italy, are illustrated in color and described, with remarks on adaptation and cultural and curing requirements.

The effect of fertilizer on the length of winter wheat heads, R. L. Cook and W. D. Baten. (Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 9, pp. 735–742*).—Measurement of many wheat spikes from field plats on three silt loams, 1935–37, showed that unfertilized wheat produced longer spikes than fertilized wheat in 1935, but the reverse in 1936. In both years fertilizer increased greatly the number of spikes per foot of row, while unfertilized soil produced twice as many in 1935 as in 1936. Therefore, when crowding is not a factor fertilizers may lengthen spikes, but shorten them when the stand is so thick that the greater number of spikes resulting from fertilization causes crowding. Certain fertilizer formulas produced longer spikes than others. In 1935 there were indications that nitrogen tended to increase spike lengths while potash tended to shorten them. Samples of 100 spikes were not found truly representative of the entire population, whereas measurement of 700 spikes from each bundle provided about the same significant differences as when all spikes were measured.

Report of the Eighth International Seed Testing Congress, 1937 (*Compte Rendu du Huitième Congres International d'Essais de Semences. København (Copenhagen): Frederiksberg Bogtryk., 1938, pp. 502+[3], [pl. 1, figs. 51]*).—This report of the proceedings of the Congress at Zürich, Switzerland, June 29 to July 3, 1937, includes among the papers The Objectives of Seed Testing in Relation to Uniformity of Results, by E. Brown and E. H. Toole (pp. 199, 200), Comparison of Methods Used in Germinating Seeds of *Poa compressa*, by A. M. Andersen (pp. 307–315), and Temperature and Other Factors Affecting the Germination of the Seed of Fescues (pp. 337–341) and The Relation of Temperature and Moisture Content to the Longevity of Chewings Fescue Seed (pp. 342–344), both by V. Kearns and E. H. Toole (all U. S. D. A.), and The Sanitary Condition of *Brassica* Seeds Received From Various Sources, by M. T. Munn (pp. 275, 276) (N. Y. State Expt. Sta.).

Noxious weeds in South Dakota.—A preliminary report (*Brookings: S. Dak. State Planning Bd., 1937, pp. [V]+III+38, figs. 7*).—Bindweed, leafy spurge, and other important weeds in South Dakota and control measures are described, and information is given on classification, source and spread, and disadvantages and benefits of weeds, and on weed and seed laws.

Crabgrass in relation to arsenicals, F. A. Welton and J. C. Carroll. (Ohio Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 10, pp. 816–826, figs. 2*).—Crabgrass was controlled by lead arsenate, preferably applied from October to April, at the rate of from 20 to 25 lb. per 1,000 sq. ft., and the chemical was equally effective whether applied in mixture with soil, as dust, or as spray. June applications also were effective after the first year. Aftereffect of lead arsenate in which growth of Kentucky bluegrass was reduced 31 and 20 percent, respectively, in the second and third years after treatment was overcome by liberal use of fertilizers high in nitrogen and limestone. Calcium arsenate, pound for pound, was more effective than lead arsenate, but injured and in fact killed some grass when more than 15 lb. per 1,000 sq. ft. was used. In action, manganese arsenate resembled calcium arsenate more than lead arsenate. Arsenic pentoxide proved impractical, for even in moderate quantities it killed desirable grasses. With the heaviest rate of application the arsenic penetrated the soil to a depth of at least 10 in., although no water-soluble arsenic was found deeper than 4 in.

The chemical composition of Russian thistle (Salsola pestifer A. Nels), R. K. Larmour and J. W. G. MacEwan (*Sci. Agr., 18 (1938), No. 12, pp. 695–699*).—Analyses of Russian thistle collected at growth stages from early bloom to maturity showed that with advancing age there is a marked reduction in ash content, some reduction in protein, an increase in fat and fiber, and little change in nitrogen-free extract. At maturity the plant did not differ much in composition from alfalfa hay. Samples from clay loam contained more ash and protein and less fiber than those from sandy loam. Crowns and roots were very much lower in protein and ash and very much higher in fiber than the tops. The roots resembled oats straw in composition.

Effectiveness of spraying with fertilizers for control of weeds on arable land, B. N. Singh and K. Das (*Jour. Amer. Soc. Agron., 30 (1938), No. 6, pp. 465–474, figs. 3*).—Spraying fertilizer salts singly or in combination gave from 33 to 73 percent control of lambsquarters and from 42 to 76 percent of pimpernel (*Anagallis arvensis*) and increases in wheat yields from 7 to 20 percent over the control. The combination of ammonium sulfate, superphosphate, and potassium sulfate gave the best control for both weeds and also the maximum wheat yield among all treatments.

Renovation and its effect on the populations of weeds in pastures, R. F. Fuelleman and L. F. Graber. (Wis. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 7, pp. 616–623, figs. 2*).—Portions of 30 bluegrass pastures in western and southwestern Wisconsin were renovated (E. S. R., 77, p. 618) in 1929, 1934, 1935, and 1936 by establishment of alfalfa, sweetclover, and red clover in thinned sods without plowing. In 1937 populations of weed species were determined in renovated areas and in adjacent areas not renovated. The 27 renovations of 1934 and 1935 reduced the total weed populations 85.7 percent in 1937, and reductions of 91 and 73 percent, respectively, resulted from a renovation in 1935 and one in 1936. Nine years after renovation of a 4-acre area of another pasture the total weed population was 93.6 percent less than in the adjacent area not renovated. Ragweeds and horseweeds, the most generally prevalent species, were reduced by renovation 85.7 and 92.1 percent, respectively, in 30 pastures. Where high percentages of total weed populations of nonrenovated portions consisted of ragweed, percentages of horseweeds were low.

HORTICULTURE

[Horticultural studies by the Georgia Station] (*Georgia Sta. Rpt. 1938, pp. 64, 65, 73–85, 90–93, figs. 11*).—Included are brief progress reports on investigations in peach storage; tung-oil tree culture; fertilizers for peppers; varieties of tomatoes; improvement of the collard; testing of the African squash; dahlia, rose, and peach varieties; spraying of peaches; root development of the peach; control of soil erosion in peach orchards; breeding of muscadine grapes; and asexual propagation of the muscadine grape.

Studies at the Mountain Substation include protection of peaches from frost, testing of fruit and vegetable varieties, spacing and pruning trials with the tomato, fertilizer trials with lettuce, and the spacing of cabbage.

[Horticultural studies by the Puerto Rico Station] (*Puerto Rico Sta. Rpt. 1937, pp. 16–27, 40, 41, 42, 62, 63–67, 72–74, 78–80, 81, 82, figs. 4*).—Herein are discussed the results of studies in vanilla production and processing, bamboo propagation and utilization, calabaza breeding, sweet corn breeding and adaptation, lima bean and turnip varieties, production of vegetables in general, pollination of *Derris elliptica*, testing of coffee varieties, light requirements of coffee, testing of tung-oil species, lawngrasses, rattan palms, processing and improvement of the mango, the growing of *Cinchona* species, and the shipment of the wax flower (*Phaeomeria speciosa*).

Relation of rate of fertilizer application to firmness and chemical composition of strawberries and tomatoes, J. E. Webster and G. F. Gray. (Okla. A. and M. Col.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), p. 204*).—With nitrogen in the form of sulfate of ammonia as the only variable, it was found that applications as large as 2,000 lb. per acre did not consistently influence the composition of strawberries as indicated by chemical and physical tests. The heaviest treatments tended to lower carbohydrates but did not affect total solids, insoluble residue, or pectin. In the case of the tomato, N applications reaching 4,000 lb. of sulfate of ammonia per acre resulted in greater changes in the carbohydrate fractions than occurred in the strawberry. Total pectin and insoluble residues were not altered significantly. Pressure and keeping tests did not indicate any significant changes.

The use of rapid chemical plant nutrient tests in fertilizer deficiency diagnoses and vegetable crop research, R. L. Carolus (*Virginia Truck Sta. Bul. 98 (1938), pp. 1527–1556*).—The results of analyses of the tissues of vegetable plants grown on different soil types and under different nutrient conditions demonstrated the accuracy of rapid chemical tests as indicators of nutrient deficiencies, whether due to actual lack in the soil or to inability of the plants to absorb certain nutrients. N deficiency, in the presence of adequate supplies of other nutrients, resulted in an extremely high concentration of soluble P and a comparatively low concentration of both soluble and nitrate N in the stems or petioles. A lack of P in the presence of adequate supplies of other essential nutrients resulted in an extremely low concentration of soluble P and usually in a very high concentration of nitrate N in the stems or petioles. In the case of K deficiency, there was found an extremely low concentration of K and usually a high concentration of soluble and nitrate N, Mg, and Ca in the stems or petioles. A deficiency of Mg in the presence of other nutrients resulted in a low concentration of Mg, generally a low concentration of N, and a high concentration of K in the stems or petioles of the plants under observation.

Yield-growth relationships in asparagus, R. E. Young. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 576, 577*).—Individual records taken over a 5-yr. period on the yield of 276 plants showed wide variation despite careful selection of crowns at planting. A high correlation (0.913 ± 0.065) was established between the number of stalks produced after harvest and the number of marketable spears. Whereas male plants were the more productive, the correlation coefficient was the same for both sexes. When number of stalks produced subsequent to harvest was correlated with weight of marketable stalks, the coefficient was 0.817 ± 0.013. The necessity of establishing a separate seed plat for high-producing plants is suggested.

Yields of asparagus as affected by severe cutting of young plantation, J. W. LLOYD and J. P. MCCOLLUM (*Illinois Sta. Bul. 448 (1938), pp. 157–172, figs. 5*).—This second report (E. S. R., 71, p. 320) on a plantation of Mary Washington asparagus set in 1926 deals chiefly with yields secured during the 1931–37 period, during which all plats were cut for 8 weeks each season. Six treatments, in which the time of initiating cutting and the duration of the cutting periods were varied in the early years, were compared. Total weights for the 7 yr. showed the detrimental effects of medium and heavy cutting during the initial year. Light cutting the second year (2 weeks) was apparently beneficial, this being the most productive treatment. On the other hand, medium cutting (4 weeks) the second year resulted in lower yields than where the cutting was delayed until the third year. On the whole, deferring all cutting until the third year after setting is conceded a safe procedure but may result in smaller total yields over a period of years than would light cutting the second year followed by moderate cutting the third year. Cutting for 8 weeks each year after the fourth gave good results under the conditions of the experiment. Cutting asparagus the first year after setting, even for a period of 2 weeks, is not deemed advisable.

U. S. No. 5 Refugee, a mosaic-resistant Refugee bean, B. L. WADE and W. J. ZAUMEYER (*U. S. Dept. Agr. Circ. 500 (1938), pp. 12, figs. 2*).—Herein is discussed a variety introduced in 1935 and since given extensive tests in comparison with mosaic-susceptible and mosaic-resistant strains of Refugee. Its superiority over other Refugee beans was found to be in (1) resistance to common bean mosaic, (2) greater pod length, (3) less pod curvature, (4) distinctive seed, (5) greater tendency for small-sized pods to approach roundness, (6) freedom from purple splashing, and (7) earlier development than some standard strains of Refugee. Yield tests have indicated that the expected yield is about that of other Refugees, except that where common bean mosaic is a factor it can be depended on to outyield mosaic-susceptible Refugees.

Carbohydrate and cellular changes in relation to pithiness of celery in cold storage, R. H. WHITE-STEVENS. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 649–653, fig. 1*).—Among the changes observed in Pascal celery in storage were a decline in hexose sugars in the outer petioles and crowns and an increase in the inner petioles. Disaccharides decreased fairly rapidly in both inner and outer petioles, while in the crowns they increased at first and later declined. Polysaccharides declined slowly in both outer and inner petioles and fluctuated and ultimately declined in the crown. Total carbohydrates were much more abundant in the marketable petioles. Osmotic values declined in general in storage, with the outer petioles showing the more rapid change. The translocation from the outer petioles is believed the chief factor affecting the decline in osmotic value of the parenchyma cells, a condition which precipitates pithiness. Some of the sugars were apparently polymerized into higher carbohydrates to be subsequently rehydrolized and translocated.

The germination of lettuce seed as affected by nutrition of the plant and the physiological age of the plant, R. C. THOMPSON. (U. S. D. A.).

(*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 599, 600*).—Germination tests on Grand Rapids lettuce seeds collected at five weekly intervals from potted plants, some of which had been fertilized with different amounts of 5–8–5 material, showed that both time of ripening and fertilizer treatment are factors in germination. In the 2 years' trials the first and second harvests gave much lower germination, and in all cases fertilizer increased seed germination materially.

Vernalization of lettuce, J. E. Knott, O. W. Terry, and E. M. Andersen. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 644–648*).—The subjection of lettuce seeds sprouted on moist filter paper for 24 hr. at 70° F. to 23° for 20 or 10 days had no effect upon holding the embryos in check. On the other hand, subjection of germinated seed to 40° for 20 or 10 days did result in an earlier appearance of seedstalks than in either the 23° lots or in the control. The 20 days at 40° had a greater effect than 10 days. In the case of White Boston lettuce, germination power suffered at 23° so that after 20 days only 27 percent of the seed grew. There was little effect at 23° in the case of New York 728.

Longevity of onion seed in relation to storage conditions, J. H. Beattie and V. R. Boswell. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), p. 553*).—Germination tests from 1930 to 1936 on onion seeds stored in 1929 in sealed and nonsealed containers under different temperature and moisture conditions showed marked interrelationships between temperature, moisture, and sealing. High moisture (10 percent) was less harmful at 20° F. than at higher temperatures. For the first 3 or 4 yr. 40° gave better germination than 20°, with the reverse true thereafter. The four varieties included maintained, in general, their relative differences in viability throughout the trials. Onion seeds sealed and stored at 20° showed no significant loss in germination after 7 yr.

Breeding tomatoes to extend the fruiting season, S. H. Yarnell and L. R. Hawthorn. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 585–589*).—In search of tomatoes that would thrive under the midsummer conditions of southwest Texas, the authors made crosses and backcrosses involving the Cherry tomato, which maintains its size and production in summer, and commercial varieties such as Bonny Best. From the backcross of Bonny Best × Red Cherry to the Bonny Best parent there were secured in the fourth generation some promising seedlings. Similar backcrosses with other varieties also yielded promising results. One seedling, named Summerset, was to be distributed to growers.

Short cuts in tomato breeding, A. F. Yeager and E. Meader. (N. Dak. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 539, 540*).—The author discusses the development of the Farthest North and Allred tomatoes to illustrate how genetic knowledge reduced greatly the task of testing seedlings.

Anatomical symptoms of nitrogen, phosphorus, and potassium deficiencies in seedling hypocotyls of tomato (Lycopersicum esculentum Mill.), V. M. Watts (*Arkansas Sta. Bul. 366 (1938), pp. 32, figs. 5*).—Using a strain of Marglobe which had been inbred for several generations to secure uniformity, plants grown in midwinter and in late spring in sand cultures were subjected, when the first true leaves were about ⅛ in. long, to variations in nutrient supply. After observable N, P, and K deficiency symptoms had appeared, cross sections of the hypocotyls were taken at 2 mm below the junction of the cotyledons. A deficiency of N or P or a complete lack of nutrients resulted in a greatly retarded growth. K deficiency resulted in only slightly retarded growth. In both series, treatments that caused greatly retarded growth resulted in low proportions of conducting as compared with total hypocotyl tissue. The difference was most pronounced in the late spring series, when light conditions favored the production of abundant carbohydrates. In both series, treatments that greatly retarded growth resulted in high proportions of phloem as compared to xylem. In general, these variations were associated with variations in external rather than internal phloem. However, in both series, the treatments that greatly retarded growth resulted in low proportions of internal as compared with external phloem.

In the winter series, K deficiency resulted in the highest ratios of conducting tissue to other tissues. In the spring series, K deficiency resulted in about the same proportions of conducting tissues as were found in the complete-nutrient plants, but in higher proportions than were found in plants of any other deficiency treatment. K deficiency resulted in ratios of phloem to xylem that were not significantly unlike those of the complete-nutrient treatments but that were consistently low as compared to similar ratios computed for plants of all other deficiency treatments. K deficiency resulted in slightly lower ratios of internal to external phloem than did the complete-nutrient treatment but higher than those of the plants of the other deficiency treatments. Deficient N and P or the complete absence of nutrients resulted in small cells in all tissues, decreased cambium, and thin cell walls in the woody tissues as compared with plants of the complete-nutrient and K-deficient lots.

Application of plant hormones to tomato ovaries, R. A. Schroeder. (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 537, 538*).—When indoleacetic lanum paste was applied completely over the ovary following the removal of the style to just above the ovary, emasculated Break O' Day tomato flowers set 87 percent and developed into fruits averaging 85 g. At the same time, undisturbed blooms set 93 percent and the fruits averaged 104 g. Hand pollination gave 85 percent set with fruits averaging 139 g. Other methods of applying growth-promoting substances failed to give adequate sets, the nearest (47 percent and 51 g average) being secured by four applications of an aqueous solution.

Varietal and strain differences in bolting of turnips, R. E. Wester and R. Magruder. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 594–598*).—The percentage of bolters produced in a 1935 spring crop of several strains each of 16 varieties of turnips grown at Beltsville, Md., ranged from 0 in Golden Ball to 100 in Shogoin, which produced no prime marketable roots. Strains within a variety differed markedly in their tendency to bolt. High, medium, and nonbolting strains planted at four 10-day intervals in the spring of 1936 showed a decrease in percentage of bolters as the time of planting was delayed. The nonbolting strains, however, produced no bolters in any instance. Apparently the absence of low temperature exposure in the later plantings, rather than day length, was the major factor concerned.

Pollination studies with North Dakota fruits, A. F. Yeager. (N. Dak. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 12, 13*).—Data are presented on self-fruitfulness in the Dolgo and Florence crabapples; Pixwell, Abundance, and Perry gooseberries; and in *Prunus pennsylvanica, P. besseyi, P. virginiana, Viburnum trilobum, Amelanchier alnifolia, Crataegus rotundifolia, Ribes aureum,* and *R. americanum.*

Orchard cover crop studies in Washington State, O. M. Morris. (Wash. State Col.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 308–312*).—Difficulty in reestablishing alfalfa sods in mature orchards led to a study of factors concerned. Where irrigation furrows were 4 ft. or more apart, alfalfa, grass, and weeds practically disappeared in the interspaces. In greenhouse studies, soil mixed with lead arsenate at the rate of 1 ton or more per acre proved detrimental to alfalfa. On the other hand, from 1 to 5 tons per acre of calcium arsenate or fluorine had no ill effects. Arsenic, rather than lead, was the deleterious factor in lead arsenate. The treatment of orchard soils with manure, alfalfa meal, wheat straw and ammonium sulfate, and ammonium sulfate plus superphosphate gave good results. The use of iron sulfate at the rate of from 500 to 1,000 lb. per acre gave immediate results but was not superior to organic matter over a period of several months.

The effects of cover crops on nitrogen and field capacity in an orchard soil, E. L. Proebsting. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 302–305*).—Over the period from 1924 to 1937, plats in an irrigated orchard of apple, apricot, peach, pear, plum, and sweet cherry were maintained in cover-crop production and in clean culture. The treatments extended across the species rows. Total nitrogen, given as percentage on an oven-dry basis, was not materially influenced by any of the treatments, which included alfalfa, annual summer legume, annual winter legume, annual winter nonlegume, and clean cultivation. The data on moisture equivalents showed also no appreciable changes attributable to soil treatment. Under the warm, semiarid conditions of Davis, Calif., the cover crops had not increased either the nitrogen or moisture-holding capacity of the soil in the 10-yr. period.

Changes in total soil nitrogen under each of several cover crops after twenty-three years, C. E. Baker. (Purdue Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 306, 307*).—In an orchard at LaFayette, Ind., where a series of cover crops had been grown annually since 1914, none of the cover crops, as indicated in analyses of soils collected in October 1937, had maintained the amount of nitrogen that was present in 1914. Some crops had actually permitted the loss of greater amounts of nitrogen than were lost from the noncropped, cultivated check plats. Millet, early rye, and vetch were the effective cover crops, but even these permitted a loss of over 20 percent of the original nitrogen. Soybeans and crimson clover were unsuccessful in the mature orchard because of poor stands. A treatment which consisted of sweetclover from 1921 to 1931 and mulch plus nitrogen since 1931 gave an apparent nitrogen increase, but unfortunately there was no 1914 analysis for this plat.

The potassium nutrition of fruit trees.—I, Soil analyses, O. Lilleland and J. G. Brown. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 327–334, figs. 3*).—In studies of over 100 California orchard soils it was found that the replaceable K content of the top 4 ft. of soil ranged from 44 to 544 p. p. m., with an average of 198 p. p. m. In general, the deciduous orchard soils of California are well supplied with K, but certain areas were found where scorching of prune foliage occurred and a response was secured to K. In the same orchards other fruits showed no deficiency symptoms. In 94 of the 100 orchards the replaceable K content decreased with depth of soil. The Neubauer procedure was found a better test of K availability for prune trees than was the determination of replaceable and water-soluble K. Neubauer tests of soils secured from orchards in England, Canada, and parts of the United States suggested that the test may not be universally useful for all cases of K deficiency.

The potash situation in Michigan orchard soils, F. N. Hewetson (*Michigan Sta. Quart. Bul., 21 (1938), No. 2, pp. 113–123, figs. 4*).—From the results of experiments based on field plats established in apple, cherry, and peach orchards and in the greenhouse, the author concludes that the use of K cannot in any way counteract the foliage burning resulting from the late spring use of Cyanamid, nor did it appear that K in itself was as yet a limiting factor to fruit tree production in Michigan.

Concerning the pore space in two orchard soils of different productivity, D. BOYNTON. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 315–319*).—Studies in two plats of McIntosh trees, which during their first 25 yr. had differed greatly in production, showed a much greater concentration of roots below 2 ft. in the more productive areas. Since it appeared probable that moisture was never at the point of unavailability in either plat in the upper 4-ft. level, measurements were made to ascertain the fraction of the soil volume available at different levels for free gaseous diffusion. In 1936, when the rainfall from May 1 to August 31 was about 35 percent below normal, the soil of the productive plat from late May onward showed a steadily increasing amount of pore space in all 4-ft. depths. In the unproductive plat the pore space of the fourth foot appeared completely full of water until the middle of July. In 1937, with 30 percent above normal precipitation, the fourth foot of the unproductive plat was never without water. Presumably, the anaerobic conditions existing in the lower soil depths of the unproductive plats limited root growth.

Effect of sod, cultivation, and straw mulch upon orchard soil moisture content, L. R. LANGORD. (Univ. Wis.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 313, 314*).—In an orchard at Sturgeon Bay, Wis., soil moisture beneath Kentucky bluegrass sod, clean cultivation, and straw mulch was found in ascending order. For example, in samples collected in triplicate on August 13, 1937, the moisture contents at from 6- to 12-in. levels were 9.2, 12.4, and 14.7 percent, respectively. Cutting grass tended usually to increase soil moisture. A heavy growth of Kentucky bluegrass induced by nitrogen treatment tended to maintain soil moisture at a higher level than under unfertilized bluegrass. By the cobalt chloride method, it was observed that in August the rates of transpiration of sweetclover, quackgrass, and bluegrass were in descending order.

Physiological dropping of fruits.—III, Plum curculio injury to young fruits in relation to physiological drop, L. R. DETJEN (*Delaware Sta. Bul.* [*212*] *(1938), pp. 87, figs. 21*).—In this third paper (E. S. R., 60, p. 748), the author points out that the greatest loss caused by curculio injury among young fruits is attributable almost entirely to grub borings, particularly if the embryo tissue is invaded. Young fruits whose seed cavities were entered by grubs generally dropped soon thereafter. Young apple and peach fruits were more vulnerable to grub injury than were those of a more advanced age, and the peach was more vulnerable than the apple. On the other hand, older fruits, in which the flesh alone was penetrated, often remained on the tree until maturity. Such factors as length of grub borings, tree vigor, and spur vigor influenced the retention of penetrated older fruits. The extent of dropping of young injured fruits varied with the intensity of the curculio infestation. Heavy infestations during light crop years or in the absence of sufficient numbers of sound reserve fruits during heavy crop years caused dropping in proportion to the intensity of infestation. Various factors, such as the physiological vigor of tree or branches, fruit thinning procedure, and age differences among trees, may mask curculio damage. In the apple the modes of the waves of the curculio-caused drop and of the physiological June drop coincided, but in the peach the insect-caused drop reached a height some days earlier. Apparently, the insect instinctively chose the larger fruits for egg deposition, but in seasons of heavy infestation the average size of the penetrated fruits might be smaller because of the enforced use of smaller fruits.

Killing trees with kindness, T. A. MERRILL (*Mich. Sta. Quart. Bul., 21 (1938), No. 2, pp. 132–136, figs. 4*).—The author cites instances in which fruit trees have been injured by untimely and incorrect spraying, excessive fertilization, etc.

Observations on certain coatings used in grafting the apple, H. A. Cardinell (*Michigan Sta. Quart. Bul., 21 (1938), No. 2, pp. 123–129, figs. 5*).—In 1936 a total of eight home-made waxes and nine proprietary materials were compared as coverages for grafts on young nursery apple trees. All the home-made waxes gave satisfactory results as judged by percentage of living scions and their growth. Certain proprietary materials proved worthy, while others gave distinctly unfavorable results. A modification of the home-made waxes to lower the melting point appeared desirable. Comparable results were secured with several of the materials in 1936 with the pear and again in 1937 with the apple.

Branch ringing and fruit set of Minkler and Arkansas (Black Twig) varieties of apples, A. E. Murneek. (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 24–26*).—The ringing of branches on paired trees, one receiving the usual fertilizer and the other receiving in addition four supplemental treatments of 4 lb. each of nitrate of soda, showed that the addditional nitrogen did not appear to alter the percentage of flowers setting fruit. There was a striking difference in fruit-set between ringed and unringed limbs on any single tree, irrespective of fertilizer treatment. Ringing, through possible effect on carbohydrate supply, reduced the various drops, especially after the first, which consisted largely of old flowers and was evidently controlled largely by pollination and fertilization.

The chlorophyll content of Wealthy and York apple leaves, W. F. Pickett. (Kans. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 251, 252*).—Using as an index of photosynthetic activity the increase in total dry matter, the author found in the case of potted 2-year-old Wealthy and York Imperial apple trees grown for 5 mo. in a greenhouse beginning Feb. 5, 1937, that Wealthy made less gain per tree. On the other hand, on the basis of unit leaf area the Wealthy was significantly more efficient. Per unit area, the leaves of the two varieties contained practically the same amount of chlorophyll *a* and *b*, but the Wealthy leaves possessed a greater internally exposed surface. Apparently, the larger internal surface permitted the Wealthy leaves to absorb more carbon dioxide and manufacture more photosynthate per unit area.

The recovery of the apple from freezing injury, M. J. Dorsey. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), p. 115*).—At approximately 28° F., ice masses began to form in the succulent tissues of the flowers or young fruits. In the case of pistils subjected to temperatures below 28° the epidermis was found to be separated completely from the deeper tissues at the third or fourth cell layer. Under favorable conditions the cells bridged the broken areas to the extent of complete recovery within 3 weeks. The set following freezes is believed to be a result of such recovery rather than escape from injury. Where seeds were killed, the fruits abscised.

Relation between number of carpels and number of cotyledons of the apple, L. R. Tucker. (Idaho Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 9–11*).—Observations on Delicious, Golden Delicious, and Rome Beauty fruits showed variation from the five-carpel norm in 7.5, 14.5, and 2.3 percent, respectively. When a large number of seeds from open-pollinated fruits were examined, the author found that polycotyledonous seeds were relatively more numerous in fruits with the higher carpel number. These parallel trends in the parental tissues and in the seeds suggested that they may be related and are possibly due to the same causal factor.

Factors influencing fertilization of apple blossoms and setting of fruit, J. R. Cooper. (Univ. Ark.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 27–35, fig. 1*).—Following the removal of the central flowers, three or four lateral buds of similar development were selected and pollinated differently with known varieties. In all cases, except where Stayman pollen was used, the self-pollinated blooms produced the lowest set. Stayman pollen produced lower sets usually than did selfing. A heavy secondary drop generally followed a heavy set, with the selfed flowers suffering the most. In all flowers except those that dropped immediately after pollination the ovules were fertilized, suggesting that later losses are due to competition. Stayman, Arkansas, and Arkansas Black were practically self- as well as inter-sterile under all conditions. Most all the varieties tested were self-incompatible. Rome, Delicious, Jonathan, Ben Davis, and Yellow Transparent proved effective pollinizers. Studies of the growth of pollen tubes in pistils indicated that the principal cause of poor setting in selfed blooms is the slow growth of the tubes. In Arkansas Black, Arkansas, and Stayman, sterility seemed due to a high degree of imperfection in both the pollen and the ovaries.

Results of further studies on the effect of bactericides on pollen germination and fruit set, L. H. MacDaniels and E. M. Hildebrand. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 14–23*).—Continuing these studies (E. S. R., 72, p. 187), the authors present results obtained in the years 1934–37, inclusive, in spraying and dusting apple trees during the blooming period with various copper and sulfur materials. From a practical viewpoint, the various materials were applied without seriously reducing the set of fruit. This was particularly true with bordeaux mixture 1–3–50 and 20–80 copper-lime dust. At the same time in the laboratory most of the materials proved highly toxic to apple and pear pollen. The relative harmlessness in the orchard is related to the structure of the stigma and the fact that it is not easily wetted. Furthermore, part of the blossoms may have been pollinated prior to the initiation of treatments.

Increasing the amount of red color on apples after harvesting, M. B. Hoffman. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 212–216*).—Observing that harvested apples exposed to direct sunlight are often injured, the author reports that in the case of McIntosh apples, spread thinly on straw and covered with 1, 2, and 3 layers of cheesecloth laid directly on the fruit or suspended directly above, splendid results were secured in the case of 3 layers of cloth 18 in. above the fruit. Conditions beneath a large, low-headed apple tree would be ideal for coloring apples. Where fruit was laid on a poultry wire frame suspended 18 in. above the soil under a tree with white cloth laid on the soil, McIntosh apples took on a high degree of color over the entire surface. When stored, the fruits held for from 7 to 14 days for coloring kept fully as well as those stored immediately.

Relation of soil moisture to firmness and storage quality of apples, M. H. Haller and P. L. Harding. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 205–211, fig. 1*).—Observations on apples obtained from irrigated and nonirrigated plats at Hancock, Md., showed a great reduction in size when deficiencies in soil moisture occurred during the growing period. The percentage of dry weight in the harvested fruit was considerably higher in apples from the dry plats. Both at harvest and after storage the fruit from the irrigated plats was consistently softer than that from the nonirrigated. Apples grown with ample moisture were more susceptible to scald, but withal the greater yields and higher quality far offset any of the handicaps.

Relation of high October temperatures to rate of ripening of apples held in air-cooled storages, R. E. Marshall (*Michigan Sta. Quart Bul., 21 (1938), No. 2, pp. 108, 109*).—The author points out the relation between high temperatures in late autumn and poor keeping of apples in air-cooled storage.

Two cases of potassium deficiency in peach orchards in south central Pennsylvania, C. O. Dunbar and R. D. Anthony. (Pa. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 320–325, figs. 4*).—Seven-year-old Elberta peach trees which failed to set fruit produced leaves of a pale olive green color, with edges bordered with red but with only occasional marginal disintegration. Nearly all the leaves were crinkled along the midrib and laterally rolled toward the midrib. Analyses of the rolled leaves showed them to be very low in K and N. Applications on July 2 of various correctives, including compounds of K, Mg, B, Zn, Cu, N, etc., showed marked response only in the case of the K treatments, especially sulfate of potash. Fruit-bud formation was also greatly stimulated. In another orchard, where a similar condition was observed but where K was applied later, recovery was not as complete. One row which during the preceding winter had received a heavy application of manure did not show any K deficiency.

Nutrient deficiency and nutrient balance with the peach, O. W. Davidson and M. A. Blake. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 339–346, figs. 3*).—Observations on 1-year-old Eclipse peach trees growing in sand cultures supplied with low concentrations of Ca in the presence of medium and high concentrations of K and with low K in the presence of medium and high concentrations of Ca showed that increasing the concentration of K caused a slight increase in the concentration of K in the plant and a marked decrease in soluble Ca and Mg. The tips of the "2 p. p. m. Ca plus high K" trees contained less Ca than the no-Ca controls. Trees with 10 p. p. m. Ca plus medium K were similar to the complete-nutrient trees except that the leaves appeared slightly thicker and more leathery. Several of the trees in the "10 p. p. m. Ca plus high K" lot showed more necrosis than did some of the trees receiving no external supply of Ca. In the low-K, high-Ca group, the antagonistic effect of Ca upon K was not so marked as the reciprocal influence. An increase in Ca from medium to high concentration resulted in only a very slight decrease in the amount of soluble K found in the stem tips. This decrease was accompanied by a marked increase in soluble P.

The classification of varieties of peaches by means of leaf characters, H. J. Sefick and M. A. Blake. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 246–250*).—On the basis of such characteristics as color, ratio of greatest width to length, angles formed by apex tip, angles formed by the base of the leaf blade, and conformation of the leaf blade, peach species and varieties were classified into various groups. The authors point out that leaf form varies with the age of the tree, position on tree, rate and quality of growth, etc., and that great care must be exercised in selection of material. In general, small leaves varied more than medium or large leaves of the same variety.

Some unusual bud sports of the peach, W. H. Upshall (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 47, 48*).—A record is presented of three peach bud variations designated as Large-Flowered Elberta, Fisher (Valiant sport), and Vedette sport. The two latter were discovered because of their decided early maturing characteristics.

Detection of polyploidy by pollen-grain size.—I, Investigations with peaches and apricots, H. Dermen. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 96–103, fig. 1*).—Examination of the pollen of 121 peaches and 3 apricots showed marked uniformity in size, apparently due to the diploid nature of the varieties studied. Large individual pollen grains observed in most of the samples are assumed to be polyploid in nature. Abortive grains varied from 2 to 50 percent in many varieties. The percentage of large-sized pollen grains was usually proportionate to the percentage of abortive grains present. The author concludes that the presence in some varieties of peach of a high percentage of abortive grains indicates that diploidy in pollen grains may be simply another manifestation of abnormality.

Mahaleb vs. Morello root stocks for Early Richmond cherries, W. Toenjes (*Michigan Sta. Quart. Bul., 21 (1938), No. 2, pp. 130, 131, figs. 2*).—Observations on Early Richmond cherry trees, part on Mahaleb and part on Morello roots and all planted in 1931, showed the Mahaleb-rooted trees to be upright-spreading in form with relatively thick branches and shoots, whereas the Morello-rooted trees had assumed, to a certain extent, the natural growth habit of the Morello. Measurements at the end of the seventh season showed trees on Mahaleb to average 14.3 in. in trunk circumference, as compared with 8.5 in. for the Morello-rooted trees. Tree spread and width were also markedly less in the case of the Morello-rooted group.

Cherry tree mortality in six Michigan counties from 1930 to 1938, G. N. Motts (*Michigan Sta. Quart. Bul., 21 (1938), No. 2, pp. 99–108, fig. 1*).—A follow-up of an earlier survey (1930) showed that approximately 15 percent of the red cherry, chiefly Montmorency, trees had been lost since that time. Five percent of the loss was due to death or removal of entire blocks, and 10 percent to the loss of scattered trees in blocks that were still in production. Since approximately one-third of the loss of scattered trees had been replaced, the net mortality in the six counties was 12 percent. Nearly two-thirds of the acreage in the abandoned blocks was lost because of horticultural factors, such as neglect in pruning, spraying, and fertilizer practices. The study indicates that under average climatic and soil conditions and with average care the sour cherry orchard is a long-lived enterprise and that with better care mortality could be substantially reduced.

Adaptability studies with date palms in southwest Texas, J. F. Wood and E. Mortensen. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 231–234*).—Stating that heavy rains occurring frequently during September and October, when dates are ripening, contribute to the spoilage of the fruits, the authors discuss the results of varietal trials at Weslaco and Winter Haven, Tex., where the fruit was less subject to spoilage than in the Lower Rio Grande Valley. Marked differences were observed in varieties in their capacity to fruit under Texas conditions. At Winter Haven in 1937 the length of time from pollination to ripening differed greatly with varieties. Hayany required 128, whereas Khasab, the latest, required 227 days.

Effectiveness of date pollen following cold storage, C. L. Crawford. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 91–95*).—In tests at Indio, Calif., pollens held 1 yr. by growers failed repeatedly to set fruit when applied to flowers. Pollen held in vials in cold storage at 8° ± 3° F. resulted in a slightly lower set of fruit than did fresh pollen. The cold storage pollen gave an average set of 58 percent, which is considered sufficient for commercial uses. Other pollen held for 1 yr. at room temperature was useless commercially. Pollen held in cold storage for 23 and 33 days was as effective as fresh pollen.

Segregations of sex types in Solo papaya and their application to the selection of seed, W. B. Storey. (Hawaii Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 83–85*).—The five sex forms observed in the Solo papaya may be broadly grouped into three sex types—female, male, and hermaphrodite. The female tree is fully fertile but produces round fruits which sell for less than the pyriform fruits produced by the hermaphrodite trees. The male trees are essentially sterile, but are useful as pollinizers for the female trees.

Selfing of hermaphrodites yields an F_1 with 1 female to 2 hermaphrodites to 0.05 male. Because of the predominance of hermaphrodites, their selfing is recommended as the desirable pollination process for securing commercial trees.

The evaluation of certain nut characters used in selecting varieties of macadamia, J. H. Beaumont. (Hawaii Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 235–237*).—All of the 68,000 trees in Hawaii are seedlings displaying considerable variation in tree and nut characters. A study of the nuts from trees selected in 1937 from a large number of groves showed much less variability than was found in a random sample of nuts collected at a processing plant. As indicated in differences between regression coefficients for the random and selected samples, the selected nuts are of approximately the same diameter and weight of kernel as the average nuts in the grove, but the shells are thinner as well as more uniform in thickness for a given diameter of nut.

The physiology of oil production in the macadamia (Macadamia integrifolia, Maiden et Betche), W. W. Jones. (Hawaii Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 239–245, figs. 3*).—Nuts collected at intervals from tagged flower clusters on selected trees were analyzed chemically after fractionation into pericarp, seed coat, and embryo. Very little oil formation occurred in the 90-day period following flowering. There was a very rapid oil increase in the next 70 days, which was also the period in which the shells became too hard to cut with a knife. Another 70 days were required to reach maturity. In this final period there was very little increase in percentage of ether extract. When nitrogen in the kernel was calculated as percentage of the ether extract residue, there was a gradual increase. When calculated as percentage of total dry weight, nitrogen decreased with oil formation. Reducing sugar decreased and sucrose increased with oil formation to the end of the rapid oil-formation period and thereafter declined to harvest.

Some varietal leaf characters in the pecan, R. V. Lott and J. V. Enzie. (N. Mex. Col. Agr.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 86, 87*).—Certain leaf characters, such as leaflet curvature, shape, area, number, and distribution on the rachis, the length of leaflet and leaf petioles, etc., were found so pronounced as to be useful in varietal identification.

Some results of selection in the northern pecan, A. S. Colby. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 88–90, fig. 1*).—Stating that northern pecans are generally smaller and more difficult to crack than the large thin-shelled southern varieties, the author enumerates named varieties and discusses an effort to locate better types in Gallatin County, Ill. A promising nut named Goforth won first prize in the 1934 contest of the Northern Nut Growers Association. Gallatin and Duley were two other promising kinds found in the search.

Effect of high temperature on metaphase pairing of Lilium longiflorum "Giganteum" and the "Creole" lily, S. L. Emsweller and P. Brierley. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), p. 104*).—Many irregularities in pairing were observed in three of four Giganteum lilies submitted to a temperature of 50° C. (122° F.) for a few minutes just about as meiosis was to be initiated in the flower buds. Thermocouple readings in the interior of the buds showed temperatures of from 45° to 46°. Heat-treated Creole plants also showed a high frequency of irregularities.

Peonies: Single and Japanese in the Illinois trial garden, F. F. Weinard and H. B. Dorner (*Illinois Sta. Bul. 447 (1938), pp. 93–156, figs. 9*).—Brief descriptions are presented of a large number of varieties tested in cooperation with the American Peony Society. The structure of the flowers is discussed, with comments on the distinguishing varietal features. Lists of recommended varieties are included.

FORESTRY

Frost hardiness of some trees and shrubs for forest planting in southern Michigan, M. E. Deters (*Michigan Sta. Quart. Bul., 21 (1938), No. 2, pp. 87–90*).—Based on a study of 47 species of forest trees and shrubs on the Kellogg reforestation tract, there is presented a classification of material into three groups: (1) Frost hardy, (2) moderately hardy, and (3) not hardy. Frost hardiness was observed to be due to various factors. such as resistance of the new growth to freezing, late opening of the buds, and site. In susceptible species, injury was much more severe on lower slopes and valley lands than at higher elevations. Frosts may deform, weaken, or kill plants, and in some cases prevent or retard their establishment on a given site. As a practical suggestion, it is recommended that only hardy species be planted on low sites and that tender species be planted on upper slopes and ridges where the frost hazard is less.

Fire Control Notes, October 1938 (*U. S. Dept. Agr., Forest Serv., Fire Control Notes, 2 (1938), No. 1, pp. [2]+40, figs. 26*).—Included are general articles and notes relative to fire protection and control activities (E. S. R., 78, p. 636).

DISEASES OF PLANTS

Crop losses from plant diseases in the United States in 1937, compiled by J. I. Wood (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1938, Sup. 108, pp. 95–131*).—This report presents tabulated data on losses due to diseases for apple, barley, dry and snap beans, cherry, field and sweet corn. cotton, grape, oats, peach, pear, peas, potato, rye, strawberry, sweetpotato, tobacco, tomato, and wheat.

The Plant Disease Reporter, December 1 and 15, 1938 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 22 (1938), Nos. 22, pp. 443–453; 23, pp. 455–465, figs. 2*).—The following items are included:

No. 22.—The occurrence in the United States of the tuber ring rot and wilt of the potato; bacterial ring rot of potato in Wyoming, by R. J. Haskell, G. H. Starr, and G. Hartman; wilt and soft rot of potatoes and the factor of seed transmission, by G. H. Starr; *Verticillium* wilt of Persian and honeydew melons, by B. A. Rudolph and W. C. Snyder; rice diseases in Louisiana in 1938, by T. C. Ryker; apple fruit diseases since harvest in Massachusetts, by O. C. Boyd; the detrimental effect of walnut to rhododendrons and other ornamentals, by P. P. Pirone; and brief notes on potato late blight in Pennsylvania, southern blight on peanuts in eastern Virginia, and the specificity of fungus allergy.

No. 23.—Observations on the prevalence of potato diseases in Maine during 1938, by R. Bonde; losses from tuber decay caused by *Phytophthora infestans;* bacterial wilt and soft rot of potato in Maine; the occurrence of pink rot (*Phytophthora* spp.) and wilt of potato in Maine; the keeping quality of Wisconsin cranberries in 1938, by N. E. Stevens; Dutch elm disease eradication; and brief notes on downy mildew on spinach in eastern Virginia, leaf scorch of apple trees and white pine and other conifers probably caused by ocean spray, leaf and stem rusts on wheat and oats in Kansas, and peach yellows in Pennsylvania in 1938.

[Phytopathology at the Georgia Station]. (Partly coop. U. S. D. A.). (*Georgia Sta. Rpt. 1938, pp. 19, 20, 23, 54, 55, 58–62, fig. 1*).—Brief reports of progress are included on work with cotton wilt control, including fertilizers and rotations to control root-knot nematodes as a means of reducing wilt losses; report of the meadow nematode, *Pratylenchus pratensis*, on cotton roots; cotton seed treatment with respect to germination and anthracnose control; *Cercospora* leaf spots of peanuts and their control; field tests of tomato hybrids and selections for resistance to *Fusarium* wilt, and disease control in field-grown tomato plants; breeding, selection, and testing for resistance to *Fusarium* wilt of watermelon; similar work with respect to root rots and other diseases of beans; frosty mildew of peach (E. S. R., 77, p. 804); winter injury to peach trees; and diseases of Austrian Winter peas and vetches.

[Plant disease investigations] (*Puerto Rico Sta. Rpt. 1937, pp. 46–49, 69–71, 82–92, fig. 1*).—Progress reports are given on studies of yams (*Dioscorea*), including delayed fungus infection following treatments of the rhizomes with hydrated lime, bordeaux mixture, and wood ashes (the last giving better results than bordeaux), storage tests under different conditions of ventilation (decay reduced under dry, well ventilated storage and lessened in continuous dry storage, and ash-treated rhizomes showing little decay even under worst storage conditions and wood ashes the only satisfactory treatment found for damp storage); control of damping-off in *Tephrosia* by soil treatments with formaldehyde or steam; bunchy top, a disease of *Carica papaya* in Puerto Rico, including the symptoms, correlation of its occurrence with insect visitation but negative results with insect transmission tests, and the susceptibility of all tested varieties; sugarcane chlorosis, with confirmation of iron deficiency as the cause but no measurable increases in yield or improvement in color of leaves by chemical applications; and control of chlorosis (similar to mottle-leaf in California, and frenching in Florida) in grapefruit, lime, and orange trees by $ZnSO_4$ sprays.

Manual for the determination of seed-borne diseases, L. C. Doyer, edited by The International Seed Testing Association (*Wageningen: H. Veenman & Sons, [1938], pp. 59, pls. 33*).—This work was accomplished in collaboration with members of the Committee for the Determination of Seed-Borne Diseases, and includes both diseases and pests. The general part takes up general classification, methods of investigation and general remarks, and improving the sanitary condition of the seed by cleaning or by treating. The special part presents data on infections and infestations caused by parasitic organisms and storehouse pests of specific crop plants, including cereals, grass seeds, peas, the various types of beans, clover, beets, flax, cabbage, celery, parsley, carrots, spinach, lettuce, onions, black salsify, tomatoes, corn-salad, and tree seeds. A section on saprophytic fungi and a list of seed-borne infections and infestations are included. The manual is illustrated by M. J. C. Schokker, and the photographs are by K. Leendertz. The bibliography contains 39 references.

New species, hosts, and distribution records of Elsinoë and Sphaceloma, A. A. Bitancourt and A. E. Jenkins. (U. S. D. A. et al.). (*Chron. Bot., 4 (1938), No. 4–5, pp. 388, 389*).—The authors list the known new species described since 1936 and the hosts of these fungus genera under some 24 plant families, in addition to certain undetermined hosts.

The biology of rusts of the genus Uredinopsis, J. H. Faull (*Jour. Arnold Arboretum, 19 (1938), No. 4, pp. 402–436*).—Continuing the author's previous studies[4] on *Uredinopsis*, in which its taxonomy and geographical distribution were considered, the present paper (except for a short section on economic relations) deals with its hosts, life history studies, developmental periods, habits of spore formation, and host restrictions. In their diploid phase species are known on *Osmunda* and on 12 genera of the Polypodiaceae. The haploid phase occurs in nature or has been obtained by culturing on 6 species of *Abies*. The life histories of 16 of the 25 recognized species of *Uredinopsis* have been demonstrated by culturing, and the details for 6 are here recorded. Teliospores are known for 23 of the 25 species. Data on the developmental periods of the species experimentally studied by the author are tabulated. Teliospore formation may begin as early as midsummer, the important determining factor being nutritional. These spores overwinter in dead infected fronds and first become viable the following spring. Incidental evidence supports the assumption that most, if not all, species of *Abies* are more or less susceptible to all species of *Uredinopsis*. On the other hand, it is reasonably certain that the species are closely restricted in their fern hosts. It has been demonstrated that *U. osmundae* comprises two biological strains. Economically, these rusts are of some importance in relation to both fir trees and ferns.

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[4] Arnold Arboretum Contrib. No. 11 (1938), pp. 120, pls. 6.

A new smut from southern Chile, G. L. Zundel. (Pa. State Col.). (*Mycologia, 30 (1938), No. 6, pp. 679, 680*).—*Ustilago gunnerae* n. sp. on *Gunnera magellanica* is described.

A new entomogenous fungus on the corn earworm, Heliothis obsoleta, V. K. Charles. (U. S. D. A.). (*Phytopathology, 28 (1938), No. 12, pp. 893–897, figs. 3*).—*Spicaria heliothis* n. sp., parasitic on the pupae of *H. obsoleta*, is discussed and described. This fungus had been observed for 2 yr. and recorded from Virginia, New Jersey, and Illinois. The pupal bodies were found to contain a mass of tightly packed mycelium, causing complete obliteration of the organs, the alimentary canal alone being uninvaded. Fall-collected pupae were covered with a white mycelial sheath. The fungus grew readily on various media, but the type of growth and degree of fructification were influenced by the kind of media employed. Fructifications were not developed under natural conditions, but the fungus fruited quickly on infected pupae in damp chambers at room temperature. To avoid confusion in any future study, attention is called to the fact that the author observed other species of *Spicaria* on the corn earworm during the course of the investigation.

The separation of plant viruses by chemical means, W. B. Allington. (Univ. Wis.). (*Phytopathology, 28 (1938), No. 12, pp. 902–918, figs. 3*).—The inactivating effects of 35 chemicals, selected on the basis of their known antiseptic properties and diverse mode of action as toxic agents, were tested on unpurified plant virus extracts. After treatment for 1 hr. at 20°–22° C. their dilutions were then inoculated into tobacco by the rubbing method. Although it was found that viruses may be grouped in a limited way by their general tolerance to chemicals, in many instances the action of the chemicals was specific, and by virtue of this specific action the components of four virus mixtures were repeatedly isolated. For example, the ordinary cucumber-mosaic virus was more tolerant to $HgCl_2$ and $AgNO_3$ than the potato ring-spot virus, but less tolerant to $CuSO_4$, $KMnO_4$, or Li_2CO_3 than the potato ring-spot virus. Hence, treatment of the virus mixture with the proper chemical agent destroyed one virus without eliminating the other, thus permitting the isolation of each component. Other virus mixtures repeatedly separated were potato ring-spot plus potato veinbanding, tobacco ring-spot plus ordinary cucumber-mosaic, and ordinary tobacco-mosaic plus tobacco ring-spot viruses. It is believed that utilization of this differential action of chemicals may become of considerable value for purposes of isolation and identification of viruses where other means have proved inconvenient or inadequate.

Plant virus inhibitors produced by microorganisms, J. Johnson. (Wis. Expt. Sta. and U. S. D. A.). (*Science, 88 (1938), No. 2293, pp. 552, 553*).—On further study (E. S. R., 78, p. 502) of the inactivation of tobacco-mosaic virus by micro-organisms it soon became evident that those used (e. g., *Aerobacter aerogenes* and *Aspergillus niger*) differed from most micro-organisms with respect to type of inactivation. They were able to produce something in culture which, when added to an extract of the virus, was immediately inhibitory to its infectivity, but not toxic to living matter in the usual sense. The immediacy of the effect suggests that it cannot be attributed to decomposition or digestion. The known properties of the inhibitor are briefly noted.

Departures from ordinary methods in controlling plant diseases, N. E. Stevens. (Univ. Ill.). (*Bot. Rev., 4 (1938), No. 12, pp. 677, 678*).—This supplementary note (E. S. R., 80, p. 204) refers to control of *Phytophthora cactorum* collar rot of apple trees by double working, freeing of cottonseed from anthracnose by storage, picking strawberries in the early morning to reduce fruit rots and leak, and use of "resistant stocks of good quality budded high" to prevent brown rot gummosis in citrus.

The use of vapor spray in plant disease control, R. M. Merrill. (U. S. D. A. and Ohio Expt. Sta.). (*Agr. Engin., 19 (1938), No. 12, p. 524*).—This note is a progress report on field tests with a vapor equipment involving the principles commonly in commercial use for cleaning brick and stone buildings. In most cases its use for applying fungicides has indicated greater possibilities than for insecticides. Bordeaux mixture and some insecticides (e. g., derris and phenothiazene) appeared to be adversely affected by the heat of the vapor, but sulfur and its combinations with lime, especially, required only about one-third the amount and proved distinctly more effective than when applied in the usual way. Experimental work with this equipment appears to indicate that the question of its adoption by growers depends entirely on whether it is possible to obtain a unit of sufficient capacity, economy of operation, and freedom from mechanical trouble to compete with the conventional hydraulic sprayer.

Combating damping-off, J. G. Horsfall (*New York State Sta. Bul. 683 (1938), pp. 46, figs. 8*).—The author attempts in this bulletin to summarize the available information on damping-off, and especially on those phases investigated by the station. Its nature, symptoms, and causes are discussed, together with a damping-off-like symptom wherein plants shrivel and die as a probable result of excess soluble salts in the soil—controlled, obviously, by leaching out the salts. Two basic aspects of damping-off control are seed protection and soil treatment. The value of seed dressings varies with the inoculum potential of the soil, although the relation is said not to be of a straight-line order. The decline in protective effect is unimportant until the inoculum potential reaches ±80 percent of maximum, above which point it falls rapidly. Two theories for the protective action are discussed, viz, the direct effect on the pathogens, and the indirect effect through absorption of copper by the host. A new red copper oxide spray for damping-off is proposed, and the practical results obtained are noted. The various methods of control are considered, and a practical discussion is given to summarize these measures.

Plant injection for diagnostic and curative purposes, W. A. Roach (*Imp. Bur. Hort. and Plant. Crops [East Malling, Kent], Tech. Commun. 10 (1938), pp. 78, pls. 2, figs. 47*).—Following an introductory section on definitions and history, the subject matter is discussed under methods of injection, determination of distribution of injected liquids, damage to foliage resulting from injection, dosage, localization of effects of injection, injection of plants when leafless, solid injection, and general application of plant injection methods. The bibliography covers about seven pages.

Soil-borne cereal diseases in coastal Oregon, R. Sprague. (U. S. D. A. and Oreg. Expt. Sta.). (*Northwest Sci., 12 (1938), No. 4, pp. 74–80*).—Hay oats were found to be attacked by a complex of soil-borne fungi thriving in the acid soil of this humid region. The most serious disease is due to *Fusarium culmorum*, but *Helminthosporium sativum*, *H. avenae*, *Rhizoctonia* sp., *Ophiobolus graminis*, and other fungi were found associated. The *Helminthosporium* species are considered weakly or doubtfully parasitic, but *Rhizoctonia* sp. is said to be a very active parasite, and wheat, barley, and spelt are also noted as parasitized by all these fungi except *H. avenae*. Winter cereals are not considered adapted to the lighter, very acid coastal soils, although Oregon Gray (Winter Turf) and Support oats proved feasible in some places. Fulhio wheat can be grown for grain, but most other wheats and all barleys have proved mainly unproductive. Spring-sown oats varied in resistance to *Fusarium* root rots, but further data and cooperative studies must determine the best ones to grow. Schoolmam, an oat variety grown primarily for grain and resistant to crown rust, proved susceptible to root rots and should be replaced if hay oats resistant to both disease types are developed.

Effect of seed disinfection and delayed sowing on the control of bunt in infested soil, J. F. MARTIN. (U. S. D. A. and Oreg. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 10, pp. 870–877*).—In the 4-yr. tests for control of *Tilletia tritici* and *T. levis* in artificially infested soil, New Improved Ceresan proved superior to the other standard seed disinfectants tested, but a rate of 3 oz. per bushel (six times the normal) sometimes caused marked reductions in stand. There was no consistent loss in effectiveness when the seeds were treated 3 weeks before sowing. Ethyl mercury iodide was about equal in effectiveness when the grain was sown 24 hr. after treatment, but there was a distinct decline in effectiveness when 10 days elapsed between treating and sowing. Copper carbonate and copper sulfate were equally effective in reducing infection by spores from the soil. One year's trial indicated that formaldehyde under certain conditions may be as effective as copper carbonate or copper sulfate.

Percentages of bunt were significantly lower when wheat was sown the day the soil was inoculated and watered than when sown 7–10 days later. Under the test conditions, between soil inoculation and sowing 50–60 days usually were required before sufficient spores were destroyed to eliminate danger from heavy infection. However, low temperatures occasionally prevented heavy infection. Low percentages of infection were obtained in untreated control plats sown 60 days or more after the soil had been inoculated with bunt spores. The seasonal trend in bunt infection in treated and untreated wheat was very similar.

Reaction of winter wheat to physiologic races of Tilletia levis Kuhn and T. tritici (Bjerk.) Wint., A. M. SCHLEHUBER (*Wash. State Col. Res. Studies, 6 (1938), No. 2, pp. 97, 98*).—Part 1 deals with the inheritance in winter wheat to physiologic races of *T. levis* and *T. tritici*, and part 2 with physiological studies on the effect of bunt on wheat. The paper is an abstract of a doctor's dissertation.

Some anatomical aspects of plant virus disease problems, K. ESAU. (Univ. Calif.). (*Bot. Rev., 4 (1938), No. 10, pp. 548–579*).—This review (with 146 literature references) discusses the nature of the anatomical modifications induced in plants by virus diseases, the histology of hosts and the problem of classification of viruses, anatomical aspects of the plant-tissue relations of certain viruses, and studies on phloem abnormalities. It is concluded from this critical analysis that anatomic studies may contribute much toward elucidation of the nature of the relationship between virus and host. However, for the realization of the full value of the research on the anatomy of diseased plants a thorough knowledge of the normal anatomy is indispensable, and lack of such knowledge is an all-too-frequent weakness in anatomical research conducted in connection with disease problems.

The overwintering of urediniospores of Puccinia graminis tritici in North Carolina, A. F. THIEL. (Univ. N. C.). (*Jour. Elisha Mitchell Sci. Soc., 54 (1938), No. 2, pp. 247–255, figs. 5*).—The results of germination tests (1935–38) showed a high percentage of viable spores during October and a sharp drop in viability during November and December, while in February the results were always negative. The weather was favorable for new uredinial infections during three different periods in October of each year and during the first week of November 1935–36. Whenever such conditions prevail and inoculum is present, uredinial infections seem to occur. New uredinia on wheat were found about 2 weeks after such favorable periods in November 1935–36, but no such favorable periods occurred in November 1937 and no new uredinia were found in November of that year. It is concluded that the primary source of stem rust inoculum in North Carolina does not come from overwintering uredospores in this State. Circumstantial evidence, including the northward march of infections in spring, appears to indicate that the primary inoculum in this State comes from a northward migration of the uredospores from States southwest of North Carolina where they overwinter.

The 1938 crown rust epidemic of oats in Arkansas in relation to hybrids of Bond and Victoria, H. R. ROSEN and L. M. WEETMAN. (Ark. Expt. Sta.). (*Phytopathology, 28 (1938), No. 12, pp. 898–901, fig. 1*).—A race (to be designated race 45) of *Puccinia coronata avenae*, very recently described from Minnesota and now found in Arkansas, was identified in 25 of 153 collections (1937). Unlike race 1, which is usually prevalent in Arkansas, this new race produces a fully susceptible reaction on Bond and its hybrids in the greenhouse. In the field, however, in the presence of the very severe epidemic of crown rust of 1938 this race was present in insignificant amounts. Compared with race 1, which was responsible for much chlorotic and necrotic spotting of leaves of Victoria and its hybrids, the new race on Bond and its hybrids offered no serious handicap in breeding for crown rust resistance. Two theories are presented to explain these differences in behavior: (1) The new race appears in the field considerably later than race 1, and (2) the reactions may be comparable to varieties of Red Rustproof oats which are also highly susceptible in the greenhouse but are largely rust-escaping in the field.

New smut and rust resistant oats from Markton crosses, F. A. COFFMAN, H. C. MURPHY, T. R. STANTON, L. C. BURNETT, and H. B. HUMPHREY. (Iowa Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 10, pp. 797–815, fig. 1*).—In the breeding program initiated in 1927, Markton oats (smut resistant) were crossed with the Richland, Iogold, Edkin, Iowa 444, and Rainbow varieties (rust resistant), and some 5,000 selections and reselections were tested. These selections have been repeatedly subjected to inoculations with spores of loose and covered smuts and stem and crown rusts, both in greenhouse and field, and some of the resistant selections have been advanced to yield test plats. Many of the selections proved to be resistant to stem rust, and to covered and loose smuts during several seasons. Some of the selections from the Markton × Rainbow cross were also resistant to certain races of crown rust, and this should afford adequate protection against crown rust in the Corn Belt in certain years, but they lack resistance to other races of crown rust, which may reduce their value in other seasons. Selections from the crosses Markton × Rainbow and Markton × Iogold have proved most promising, and some of them offer exceptional possibilities as crop varieties. Many of these selections are superior in yield not only to the parent varieties but also to the standard varieties grown in the Corn Belt. Some of them are also superior to standard varieties in bushel weight. Many of the Markton × Rainbow selections have exceptionally stiff straw, and some have yielded comparatively well under conditions of extreme drought. Some of the highest yielding selections from this cross are resistant to the smuts and rusts, in addition to possessing stiff straw and high bushel weight.

Comparison of different methods of inoculating oat seed with smut, R. W. Leukel, T. R. Stanton, and H. Stevens. (U. S. D. A. and Idaho Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 10, pp. 878–882*).—This study led to the following conclusions: Immersing the seeds in a suspension of smut spores under vacuum may result in infection percentages as high as those obtained by dehulling the seeds and dusting with spores. Inoculation by the latter procedure, besides being extremely laborious, may cause severe reductions in emergence and stand, even in smut-resistant varieties. The first method offers a rapid and effective technic for inoculating large numbers of oat seeds with spores of loose or covered smut.

Host-parasite relations in red clover plants resistant and susceptible to powdery mildew, Erysiphe polygoni, O. F. Smith. (U. S. D. A. and Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 9, pp. 671–682, figs. 4*).—Cytological studies are reported on the infection and development of *E. polygoni* on susceptible, moderately resistant, and highly resistant plants. The early stages proved to be the same in all three cases. The spores germinated, formed appressoria, and penetrated directly into the epidermal cells, with a concurrent ingrowth of the wall at each point of penetration. In susceptible plants an infection hypha, after entry, developed into a simple haustorium later surrounded by a thick sheath containing considerable dark-staining, somewhat granular material. On highly resistant hosts the hyphal progress was stopped soon after entry due to an antagonistic reaction between host and parasite. The host cytoplasm stained heavily and appeared to undergo some degree of disorganization around the infection focus. With entry into the host protoplast the antagonistic reaction became more intense, the hypha and host cell contents finally becoming a disorganized mass of dark-staining material with ultimate collapse of the infected cell. In some plants only the infected cell became necrotic, while in others small brown necrotic areas developed. In moderately resistant plants the fungus became established in much the same manner as in susceptible hosts, but the haustoria were usually of reduced size. Surface growth varied with individuals, being roughly in proportion to the degree of susceptibility of the host. The host nucleus moved toward the invader in both resistant and susceptible plants.

Studies on pea virus 1, H. T. Osborn (*Phytopathology, 28 (1938), No. 12, pp. 923–934, fig. 1*).—Although by the ordinary rubbing methods infection by this virus in *Vicia faba* is difficult to obtain, it is transmissible by the carborundum-powder method. However, subinoculation from mechanically inoculated plants was more difficult than from plants inoculated by aphid colonies. The virus was recovered from infected plants as soon as 3 days after inoculation by colonies of pea aphids, *Macrosiphum pisi*. Subinoculation from mechanically inoculated plants usually failed when done within less than 24 days after inoculation, and in many plants after much longer periods. Furthermore, subinoculation from aphid-inoculated plants also failed sometimes. The virus was carried through four serial passages by mechanical inoculation into *V. faba*. Subinoculation appeared to be even more difficult after several serial passages by mechanical inoculation in *V. faba*. The virus proved infective after heating in vitro for 10 min. at various temperatures up to 64° C., but was not infective after heating to 66°. It was infective after aging in vitro up to 4 days but not after 5 days, and after dilution to 10^{-3} but not after dilution to 10^{-4}. Aphids retained the virus up to 8 days when removed from diseased plants and transferred to a succession of healthy plants held in a room at 35°. The failure of aphids to cause infection after holding for periods longer than 8 days at 35° may have been due to a loss of infective individuals in colonies held at this temperature. The two strains of pea virus 1 described differed in the symptoms induced and in the ease of transmission by mechanical means.

Bacterial wilt and rot of potatoes—some suggestions for its detection, verification, and control, H. N. Racicot, D. B. O. Savile, and I. L. Conners (*Amer. Potato Jour., 15 (1938), No. 11, pp. 312–318, figs. 4*).—This comparatively new and serious disease has already been shown to be due to an organism resembling both *Phytomonas michiganensis* and *P. sepedonica*. The trouble appears to be spreading, but its geographical distribution is not fully known though it has been reported from widely scattered localities in North America. The symptoms are described. The most important mode of overwintering is said to be in slightly affected tubers, from which it is readily spread by the cutting knife. Control measures are discussed, the chief of which lies in the use of disease-free seed. The importance of prompt and correct diagnosis is stressed, and directions for making smears from vines and tubers and for collecting and mailing specimens are given.

The influence of maturity of potato varieties upon their susceptibility to late blight, W. R. Mills. (Cornell Univ.). (*Amer. Potato Jour., 15 (1938), No. 11, pp. 318–325*).—"Artificially induced maturity of five varieties of potatoes did not increase susceptibility to *Phytophthora infestans*. The only significant change observed was decreased susceptibility of mature Smooth Rural plants."

Soil reaction in relation to potato scab, R. H. Larson, A. R. Albert, and J. C. Walker. (Wis. Expt. Sta.). (*Amer. Potato Jour., 15 (1938), No. 11, pp. 325–330*).—In tests with Irish Cobbler or Katahdin potatoes continuing three seasons (1935–37) on scab-infested silt loam, sandy loam, and muck soils in Wisconsin, treated with calcium hydroxide, calcium carbonate, or sulfur in different amounts to shift the soil reaction, the results of others indicating that the disease is reduced with increasing acidity were confirmed, but in no case was scab eliminated when the pH was held below 5 even for a 2-yr. period. Lime applied at rates up to 8 tons per acre and change of soil reaction to as high as pH 8 failed to produce any reduction of scab. Sulfur applications are thought to have only limited usefulness, confined to certain soils of the State. The use of lime to benefit certain legumes in rotations admittedly complicates the scab control problem.

Disease resistance tests, E. M. Summers, R. D. Rands, and E. V. Abbott. (U. S. D. A.). (*Sugar Bul., 17 (1938), No. 1, pp. 30–32*).—A pathological summary of agronomic selections from the C. P. 1929–33 sugarcane seedling series is compared with present commercial varieties. Several of the more extensively tested selections are said to promise considerable reduction in losses from the major diseases on present commercial varieties, should they be found satisfactory for commercial use in other respects. Of the 9,185 seedlings examined 65 have been assigned new C. P. numbers, and many of them combine resistance to red rot and mosaic with an indicated early maturity.

Pythium root rot of sugarcane, R. D. Rands and E. Dopp (*U. S. Dept. Agr., Tech. Bul. 666 (1938), pp. 96, pls. 4, figs. 21*).—Root rot was noted by the

Louisiana Experiment Station to be causing widespread damage to the old noble varieties as early as 1908, and the history of this and other sugarcane diseases is reviewed. *P. arrhenomanes* was found to be the principal cause of root rot. Although root-disease epidemics have been reported from most sugarcane-producing countries, this fungus has been identified only from Hawaii, the Philippines, Mauritius, Canada (on cereals), and the United States. In surveys of the Gulf States, 12 additional species of *Pythium* were isolated from decaying roots, usually associated with a weakened root condition due to other causes. *P. dissotocum* and *P. graminicolum* caused significant damage under such conditions, although much less than that due to *P. arrhenomanes*.

Physiological specialization and, to some extent, varietal adaptation of the highly variable *P. arrhenomanes* in Louisiana have been demonstrated by tests with more than 200 isolates from representative plantations. Significant differences in average virulence occurred among different plantations or localities, as well as between an earlier and a more recent survey. Since the latter could not readily be explained as due to attenuation, an actual increase in average virulence during the 5–7 yr. separating the surveys is tentatively assumed. This might be due, in part, to segregation and multiplication of certain biotypes in response to the use of more resistant varieties. A serious decline in yield of the susceptible P. O. J. 234 in relation to the highly resistant Co. 290 and C. P. 807 varieties in replicated yield comparisons conducted by others during the past 8 yr. has been associated with an apparent increase in root-rot severity. This possibly reflects, in part at least, the above-ground increased virulence of the *Pythium*. The importance of employing the most virulent locally known strains for root-rot resistance tests of new seedling selections is emphasized.

The apparent degrees of resistance or susceptibility in field tests of well-known varieties of the recognized sugarcane species are reported. Most of the noble varieties (*Saccharum officinarum*) proved highly susceptible, while the Chinese canes (*S. sinense*) and wild sugarcane (*S. spontaneum*) were highly resistant. Two Indian varieties of *S. barberi* and a single variety of the New Guinea wild cane (*S. robustum*) were intermediate. Among the present commercial varieties in Louisiana, Co. 290, C. P. 807, C. P. 28/11, and C. P. 29/116 are classed as resistant and as possessing sufficient vigor for planting on the "mixed" and heavy soils. C. P. 29/320 is intermediate, while Co. 281 and C. P. 28/19 are susceptible and ordinarily succeed only in light, well-drained soils. Studies on the influence of various soil and climatic factors on the severity of root rot are also reported and certain ameliorative measures suggested.

The bibliography presents 102 references.

Red rot of sugarcane, E. V. ABBOTT (*U. S. Dept. Agr., Tech. Bul. 641 (1938), pp. 96, pls. 10, figs. 10*).—In this comprehensive study, particular attention was given to determining the cause of the sudden failure of P. O. J. 213 in Louisiana from this infection. A detailed survey of the red-rot flora of sugarcane varieties in the southern United States indicated the presence of two morphological races of *Colletotrichum falcatum* termed light and dark, respectively. Both were also obtained from *Sorghum halepense*, *S. vulgare*, and *Erianthus giganteus*. Changes in the relative incidence of these races in Louisiana (1930–38) are discussed in detail, and evidence is presented as indicating that they were influenced by changes in the relative acreages of commercial varieties during the survey period. It is concluded that the light race was responsible for the failure of P. O. J. 213, and the dark race for the decline of C. P. 807. Further evidence of the relation of cultural races to the decline of sugarcane varieties was obtained in the sirup-producing States and is discussed in detail. In comparative tests on a resistant and a susceptible sugarcane variety, the isolates of the light race were, in general, more virulent, but a degree of specialization within each cultural race was also noted.

A laboratory method of testing large numbers of sugarcane seedlings for resistance is described, together with supplemental field inoculations on promising agronomic selections. The reactions of more than 100 varieties are given, including commercial varieties, unreleased seedlings, representatives of the 5 species of *Saccharum*, and interspecific and miscellaneous hybrids. High susceptibility proved characteristic of *S. officinarum*, and certain forms of *S. spontaneum* are said to be the most probable source of resistance for the breeding program.

In a study of the distribution of resistance among the seedlings of four complete seedling progenies, no correlation was found between resistance and growth habit of the female parent (Co. 281), agronomic character of the seedlings, or sucrose content. In a further study of the field selections of 24 commercial crosses, it was found that this variety had entered into the parentage of nearly all of them from which any considerable number of resistant seedlings was obtained.

The nature of resistance to red rot in sugarcane varieties is considered briefly, and preliminary evidence is presented that phenolic compounds may be involved in the resistance to spread in the host tissues. The control of red rot under field conditions is discussed.

Control of the blue mold (downy mildew) disease of tobacco by spraying, E. E. Clayton, J. G. Gaines, T. E. Smith, W. M. Lunn, and K. J. Shaw. (Coop. Ga. Coastal Plain, N. C., S. C., and Md. Expt. Stas., et al.). (*U. S. Dept. Agr., Tech. Bul. 650 (1938), pp. 23, figs. 5*).—Colloidal copper, copper-soap, and calcium monosulfide all proved superior to bordeaux mixture against downy mildew (*Peronospora tabacina*), but none were effective enough to be recommended. A combination of cuprous oxide with emulsified cottonseed oil was distinctly superior, and the 1937 outbreak gave opportunity for a thorough test of its effectiveness. Beds were sprayed semiweekly and, in most cases, 5–6 applications were made prior to the general outbreak, spraying being continued until the plants were set out or the disease had become inactive. The maximum number of applications required under the 1937 conditions was ±15, while the maximum number actually applied was 23. The results led to the following conclusions:

The appearance of mildew was usually though not invariably delayed by spraying, but its development was much delayed and the severity of attack was greatly minimized. The maximum plant mortality in any experimentally sprayed bed was 16 percent, as against 94 percent in the comparable untreated beds. In only two sprayed beds were more than 5 percent killed, and in the majority of beds none, whereas in the majority of control beds 20–50 percent of the plants were destroyed. The active developmental period of the disease in sprayed beds was never more than 4 days, after which recovery was prompt and complete, and there was little transplanting delay. Without spraying, the mildew was active up to 3 weeks, and transplanting was delayed for 10 days to 5 weeks. Mildew in sprayed beds gave no field hazard. Spraying proved effective under severe disease conditions, and the greatest gains were then obtained. On the average, 2.5–3.5 acres of tobacco were set from each 100 sq. yd. of sprayed bed during the normal transplanting season, while from unsprayed beds 0–1½ acres were set. The results were eminently satisfactory under the severe test conditions imposed, but it is not assumed that all possible disease conditions have yet been encountered with respect to this comparatively recent problem.

Amylase activity of mosaic tobacco, A. K. Balls and L. F. Martin. (U. S. D. A.). (*Enzymologia, 5 (1938), No. 4, pp. 233–238, fig. 1*).—The extractable amylase in tobacco leaves increased with their age, but when infected with common or yellow mosaic there were definite abnormalities in its rate of development for which the presence of the virus protein itself did not seem to offer an explanation. This abnormal amylase picture apparently results from a disturbed cell metabolism, and in much the same sense the virus protein, according to the authors, may be regarded as a result of the disease, the unexplained difference lying in the fact that the protein may cause the disease as well as result from it. Infected with common mosaic, the plants produced less amylase than normally, and mainly at the expense of the starch-liquefying effect. In yellow mosaic more amylase was produced, and mainly of the dextrinizing type. The virus protein was without effect on the amylolytic activity of either tobacco or malt. Since the evidence of an inhibitor or activator of tobacco or of malt amylase in extracts of either normal or diseased tobacco is negative, it may be concluded that the observed differences are in amount rather than in the intrinsic activity of amylase formed in the diseased plants.

A mosaic disease of turnip, C. M. Tompkins. (Calif Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 8, pp. 589–602, figs. 4*).—Typical specimens of this mosaic, reported as prevalent on Long Island, N. Y., were obtained from this locality for greenhouse studies in comparison with virus diseases of certain cultivated crucifers in California. The turnip mosaic is characterized by coarse vein clearing of the leaves in the early stages, followed by conspicuous mottling with raised islands, crinkling, and stunting of the plants. In the greenhouse the virus was readily transmitted by *Myzus persicae* and *Brevicoryne brassicae*, and also by mechanical inoculation using the carborundum-abrasive method. The incubation period was 13–21 days. The virus was active at 2 days, but was inactivated after aging for 3 days at 22° C. The inactivation temperature lay between 60° and 63°, and a dilution tolerance of 1:3,000 was established. The host plants included 18 species of 12 genera and 6 families, 11 species belonging to the Cruciferae and comprising cabbage, cauliflower, rutabaga, leaf or Chinese mustard (*Brassica juncea*), Chinese cabbage (*B. pe-tsai*), annual stock (*Matthiola incana*), dames violet (*Hesperis matronalis*), honesty (*Lunaria annua*), Virginian stock (*Malcomia maritima*), and Chinese radish (*Raphanus sativus longipinnatus*).

The spread of apple mosaic, F. M. Blodgett. (Cornell Univ.). (*Phytopathology, 28 (1938), No. 12, pp. 937, 938*).—The author presents evidence of a slow spread of this mosaic or variegation on apple which amounted to an increase of 51.4 percent in one 5-yr. period and to 69.8 in another. In several orchards the trees recorded as mosaic at the first observation were largely in a single row, and subsequent spread tended to follow the rows and in at least two cases in the direction followed in pruning operations. It is therefore believed probable that an explanation of this spread will be found connected with pruning rather than with insect transmission.

Further studies on host relationships of peach mosaic in southern California, L. C. Cochran and L. M. Hutchins. (Calif. Citrus Expt. Sta. and U. S. D. A.). (*Phytopathology, 28 (1938), No. 12, pp. 890–892, fig. 1*).—Inoculations by budding or grafting from mosaicked peach to apricot, plum, prune, and almond tested for previous absence of infection indicated these four recipients to become symptomless carriers of the peach mosaic virus when so inoculated. Further tests on almond showed that this virus may be present for at least 3 yr. without inducing symptoms. When buds or scions from trees showing typical apricot mosaic were grafted to healthy peach trees, symptoms typical of peach mosaic followed. Naturally occurring mosaics of almond, apricot, and prune were successfully transmitted to normal trees of the respective species, with incubation periods similar to that of peach mosaic. Tests in plum and prune orchards contiguous to badly mosaicked peach orchards revealed no evidence of spontaneous spread from peach. It thus appears to be established that, while certain spontaneously occurring mosaics of almond, apricot, and plum can induce peach-mosaic-like symptoms in peach, a reciprocal relationship may not be true. While this evidence seems to indicate that more than one mosaic-inducing virus of *Prunus* spp. may occur in southern California, it is difficult to explain why all should induce symptoms in peach indistinguishable from peach mosaic in peach. It is believed that the possibility of virus strains must be considered but that further work will be necessary before definite conclusions can be drawn.

The present status and some observations on the "X" disease of the peach in Connecticut, E. M. Stoddard. (Conn. [New Haven] Expt. Sta.). (*Conn. Pomol. Soc. Proc., 47 (1937), pp. 95–97*).—The known facts regarding this disease, as stated in this progress report, are that it is causing more severe damage each year in infected orchards, that the number of infected orchards is increasing, that there is very little hope of a tree recovering when once infected, and that thus far the authors have never found X-diseased peach trees that were not associated with diseased choke cherry trees. Other pertinent theoretical and concrete data are briefly noted.

Kelsey spot of plums (*New Jersey Stas. Plant Disease Notes, 16 (1938), No. 5, pp. 13–16*).—This records the appearance in several New Jersey orchards (1937–38) of a peculiar fruit spot observed on maturing plums exhibiting similar symptoms and evidently due to the same high temperature conditions as the disease called Kelsey spot, previously reported in South Africa and in California (E. S. R., 78, p. 358). The only control method thus far suggested is to lower the air temperature during the critical ripening period by green cover crops, though it is pointed out that there is no direct evidence that this procedure would be either feasible or effective under New Jersey conditions.

Resistance in the red raspberry to the mosaic vector Amphorophora rubi Kalt., G. A. Huber and C. D. Schwartze. (Wash. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 8, pp. 623–633, figs. 2*).—This mosaic disease is reported to be gradually spreading to new localities and to be of major importance in western Washington because of the high susceptibility of the principal commercial variety Cuthbert. The investigation was undertaken (1935–37) to determine the relative resistance of named varieties and hybrids to the vector, the study revealing various degrees of reaction as tested in western Washington. In the greenhouse *A. rubi* failed to reproduce and maintain its population on the Indian Summer, Lloyd George, Pyne Imperial, and Pyne Royal varieties, while reproduction was slow and the population remained small on Antwerp, Herbert, Marcy, and Newburgh. On the other hand, aphids fed and reproduced abundantly on Cayuga, Chief, Cuthbert, June, Katherine, King, Latham, Laxton Bountiful, Laxton Renown, Laxton Reward, Marlboro, Newman, Preussen, Ranere (St. Regis), Red Cross, Rote Riesen, Seneca, Taylor, and Viking.

In experimental plats and commercial plantings this aphid was found not to feed on those varieties exhibiting resistance to it in the greenhouse, while populations were small on those showing partial resistance and comparatively large on the susceptible varieties. Greenhouse tests and field observations with red raspberry seedlings indicated that resistance to *A. rubi* is inherited and transmitted when a resistant variety is crossed with a susceptible one. Lloyd George proved to be heterozygous for resistance. The results indicate greenhouse testing to be a convenient and rapid method for determining the relative resistance of varieties and hybrids of red raspberry to *A. rubi*.

Development of psorosis (scaly bark) in relation to origin and history of various citrus varieties, H. S. FAWCETT. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 24 (1938), No. 1, pp. 6, 30–32, figs. 4*).—The author briefly reviews the evidence as to the virus nature and relations of psorosis, and states that it strongly indicates that transmission "is apparently limited in California principally to budding, and that only rarely does it appear to be spread by other means, such as by the seed or by root fusion." From a study of the history of the propagation of the Washington or Bahia and the Valencia oranges and the Eureka and Lisbon lemons and the present status of the disease in them, he concludes that none of these original varieties came to California with the virus in them, but that there seems to be circumstantial evidence that the virus was in some other variety which, when topworked to any of these varieties, caused the virus to come into their tops. The buds from these tops when used for propagation then readily spread the virus and resulted in psorosis. The use of buds only from healthy trees, coupled with the registration of such trees under the voluntary service instituted by the California Department of Agriculture, is recommended.

Results of three years spraying with low lime bordeaux mixture for the control of pecan scab, J. R. COLE and J. R. LARGE. (U. S. D. A.). (*Southeast. Pecan Growers Assoc. Proc., 32 (1938), pp. 28, 30, 32–34*).—The results indicate that one prepollination spray with 2–0.5–50 bordeaux mixture soon after foliation begins, followed by three applications of 3–1–50 bordeaux at intervals of 3–4 weeks, will satisfactorily control the scab disease. Sanitary measures are considered important, and should be enforced under all circumstances. The greatest infection occurred during periods of heaviest rainfall, especially when these rains came in late afternoons or evenings. Bordeaux preparation and equipment are briefly discussed.

Relation of soil temperature to chlorosis of gardenia, L. H. JONES. (Mass. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 8, pp. 611–621, figs. 4*).—Finding in a preliminary test that high soil temperatures would dissipate the chlorosis of *Gardenia veitchii*, detailed studies were carried out with sufficient repetitions to warrant the following conclusions by the author:

A chlorosis could be induced by soil temperatures of 18° C. or less, the intensity increasing as the temperature decreased, while at 20° and 22° there were traces without increase in intensity as time went on. No deficiency in nutrient elements was shown by analyses of leaves or terminal twigs from healthy and chlorotic plants, though analytical results characteristic of unhealthy plants were indicated in the case of the leaves. Length-of-day changes failed to affect the onset of chlorosis. The time required to induce chlorosis varied with the conditions of the plants when the temperatures were lowered, hard plants under medium temperatures developing the trouble more slowly than soft plants under high temperatures. The position of the plants in the constant soil-temperature apparatus had no influence on the induction or dissipation of chlorosis. A sharp rise in soil temperature maintained for 13 days proved sufficient to initiate a gradual return of a healthy green color in affected plants. An inverse correlation was found between the growth rate and the intensity of symptom development. Soil temperature affected the size of the leaves, their length increasing with rises in temperature. At 8° and 10° the plants became chlorotic if they had been growing slowly, while if they had been growing rapidly at high temperatures they failed to become chlorotic with lowering of temperature but developed a very dark green color and ceased to grow at all. Plants growing at a fairly high soil temperature wilted following a sudden drop to 8° and 10°, but eventually recovered their turgidity. A rapid senescence of the oldest leaves followed lowering to 10° or less. Plants grown under a high soil temperature followed by subjection to a low temperature grew little but set buds. On the other hand, those that had been under a low temperature followed by subjection to a high temperature grew vigorously but set no buds. It is believed evident that soil temperature is a factor which may alter the physiological phases of both vegetative and reproductive development in gardenia.

The probable effect of peduncle abscission on the incidence of "die-back" of roses, J. C. Ratsek. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 788–794, fig. 1*).—Rapid abscission was found to reduce the incidence of die-back, and factors tending to provide a rapid supply of food to the region of layer formation increased the rapidity of abscission. Thus, cultural methods that increase the supply of available food will reduce the incidence of die-back.

A bacterial blight of stocks caused by Phytomonas syringae, W. H. Burkholder. (Cornell Univ.). (*Phytopathology, 28 (1938), No. 12, pp. 935, 936*).—*P. syringae* causes a leaf blight of annual stock *Matthiola incana* var. *annua* similar in appearance to that due to *P. matthiolae*. The descriptions of the two pathogens in culture are similar, and therefore *P. matthiolae* is considered a synonym of *P. syringae*.

Boiling water vs. steam sterilization of soil for sweet peas, A. Laurie and R. H. Simon. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 801–806*).—The results of the tests reported indicate but little difference in effect between steam and hot-water sterilization, provided leaching is practiced after steaming to remove the accumulation of soluble salts which cause delayed growth and slow germination. The advantages of steam are that less time is required to steam and plant afterwards, and that it is more effective in controlling fungus and bacterial diseases.

Overwintering of Taphrina robinsoniana, W. W. Ray. (Cornell Univ.). (*Phytopathology, 28 (1938), No. 12, pp. 919–922, fig. 1*).—Histologically the dormant female catkins of *Alnus incana* exhibited no perennial mycelium in the tissues. Applications of 1:40 lime-sulfur (dormant spray) considerably reduced the percentage of infection. Female catkin clusters enclosed in transparent waterproof bags reached maturity without infection. The results of cultural studies suggest that spores may remain viable in nature from the time of their dispersion until the inoculation period. It is thus concluded that this fungus does not overwinter by means of perennial mycelium in the bract tissue of female catkins of *A. incana*.

Prevalence of wilt diseases in maple and elm, F. C. Strong (*Michigan Sta. Quart. Bul., 21 (1938), No. 2, pp. 96–99*).—Two of the most important native pathogens of elms are *Verticillium* sp. and *Dothiorella ulmicola* (formerly known as *Cephalosporium* sp.), while other species found capable of causing trees to wilt and branches to die are *Sphaeropsis*, *Coniothyrium*, and *Vermicularia*. The most serious wilt-inducing pathogen of elms is of course the introduced *Ceratostomella ulmi*. *Verticillium* is the only known parasitic fungus causing wilt in maple. It has been identified with the fungus infecting elm as well as the Japanese barberry and other ornamental shrubs. Wilting and dying of the branches of elm and maple may also be induced by nonparasitic causes, such as deficient water supply due to drought or root injury as well as the presence of illuminating gas in the soil, and by suffocation of the roots through packing of the soil. Means of differentiating these troubles and their incidence in Michigan are briefly noted, and a special study was made of the prevalence of *Verticillium* wilt in maples. The greater susceptibility of Norway maple as compared to hard maple is indicated. Control measures for the various troubles are briefly outlined.

Studies on probable damage by blister rust in some representative stands of young western white pine, T. W. Childs and J. W. Kimmey. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *57* (*1938*), *No. 8, pp. 557–568, figs. 3*).—From examinations of *Pinus monticola* for infection in several British Columbia and Idaho areas and calculations based on previous studies of rust behavior on pines as to the probable effect of each canker on the tree, the percentage of cankers capable of damaging was found to range from nearly 100 in the smallest trees to less than 30 in those 45–50 ft. tall. However, the larger trees (up to at least 40 ft.) become much more heavily infected than do small trees in the same stand, and they are consequently more liable to injury. Within a given height class the percentage of cankers capable of damaging and the time required for such damage to occur may vary with crown width, rate at which branches are killed by suppression, etc. Although full destruction of extensive young stands can occur only with enormous numbers of cankers, serious injury may be induced by a relatively few, and stands exposed to even moderately severe infection are practically destroyed before commercial maturity.

Differentiation of wood-decaying fungi by their reactions on gallic or tannic acid medium, R. W. Davidson, W. A. Campbell, and D. J. Blaisdell. (U. S. D. A., Pa. Expt. Sta., et al.). (*Jour. Agr. Res.*, *57* (*1938*), *No. 9, pp. 683–695, figs. 3*).—Of the 210 fungi tested for oxidases by the Bavendamm gallic and tannic acid method, 29 (80 percent) of those associated with brown carbonizing rots gave no reaction with media containing either acid. *Fistulina hepatica*, associated with a dark firm rot, was negative, as were also *Stereum frustulosum*, associated with a white pocket rot, and *Polyporus dichrous*, associated with a white rot. Four fungi, the rots associated with which were unknown, gave no reaction, and 7 fungi associated with brown carbonizing rots gave inconsistent results. Of the fungi associated with white rots, 156 (96 percent) gave positive reactions, and 9 whose rots were unknown reacted similarly. *S. subpileatum*, associated with a white pocket rot similar to that by *S. frustulosum*, gave mostly positive results on gallic acid but was negative on tannic acid. *Schizophyllum commune*, a white rot fungus, was negative on gallic acid but positive on tannic acid media, with good growth on both. With white rot fungi the intensity and rate of the reaction showed considerable variation. "Growth behavior for different species on gallic acid and tannic acid media showed variations of value in the cultural identification of fungi. Ten different growth and reaction groups are described, and the species are listed under these groups."

Studies on Polyporus abietinus.—II, The utilization of cellulose and lignin by the fungus, K. H. Garren (*Phytopathology*, *28* (*1938*), *No. 12, pp. 875–878*).—Continuing this series (E. S. R., 80, p. 364), when grown on a medium containing either cellulose or lignin as the only organic nutrient source this fungus is able to utilize either of these materials, though cellulose proved to be the better source of nutrition. This indicates that when coniferous sapwood is decayed by *P. abietinus* both the cellulose and lignin are destroyed. Nitrogenous materials stimulate growth on a lignin medium, but not on a cellulose medium. When grown on media containing tannic acid the fungus forms a brown halo, indicating the formation of laccase. The latter also probably catalyzes the oxidation of the phenolic groups in lignin, hence causing a partial decomposition of the lignin.

Experiments to determine the relative toxicity of ammonium chloro-acetate and related chemicals to the potato eelworm (Heterodera schachtii, E. M. SMEDLEY (*Jour. Helminthol., 16 (1938), No. 3, pp. 177–180*).—Laboratory tests indicated that various chloroacetates are toxic to the larvae of *H. schachtii*, and that ammonium chloroacetate especially should effect good control of the potato strain at practical strengths.

Observations on the destruction of the stem eelworm, Anguillulina dipsaci, by the fungus Arthrobotrys oligospora Fres., T. GOODEY (*Jour. Helminthol., 16 (1938), No. 3, pp. 159–164, figs. 4*).—The author records observations on two cases where he found this fungus capturing and destroying the stem nematode within plant tissues (*Calceolaria integrifolia* and *Saxifraga cotyledon*).

ECONOMIC ZOOLOGY—ENTOMOLOGY

Officials and organizations concerned with wildlife protection, 1938, compiled by F. G. GRIMES (*U. S. Dept. Agr., Misc. Pub. 329 (1938), pp. 15*).—This constitutes the thirty-eighth annual directory concerned with wildlife protection and conservation (E. S. R., 78, p. 362).

An analysis of the value of refuges for cyclic game species, F. C. EDMINSTER (*Jour. Wildlife Mangt., 1 (1937), No. 1–2, pp. 37–41*).—The results of the author's study to date have led to the conclusion "that refuges are of no value in maintaining populations of cyclic species such as the ruffed grouse, cottontail rabbit, and gray squirrel. Fluctuations continue regardless of the protected or unprotected status of the coverts. Whether or not refuges are of value in assisting these species in their recovery from the scarcity phase of the cycle will be determined as the study continues.

"The possible function of a refuge for preserving seed stock on areas that have an abnormally high hunting pressure, as those near large cities, has not been tested, but the present study would seem to indicate that such areas would only function to prevent extermination, not as a means of furnishing continued hunting on surrounding lands."

Effect upon wildlife of spraying for control of gipsy moths, A. FROST (*Jour. Wildlife Mangt., 2 (1938), No. 1, pp. 13–16*).—The effects that spraying may have upon the wildlife population, here considered, are based upon observations made during the season of 1937 in the Fishkill Mountains of New York, where lead arsenate was applied against the largest infestation of gypsy moths that occurred in the State.

Worm parasites in their relation to wildlife investigations, H. J. VAN CLEAVE (*Jour. Wildlife Mangt., 1 (1937), No. 1–2, pp. 21–27*).—A general discussion of the subject.

[Contributions on diseases and parasites of wildlife] (In *Transactions of the Third North American Wildlife Conference. Washington, D. C.: Amer. Wildlife Inst., 1938, pp. 705–708, 869–901*).—These contributions include Fire Ant Problem in the Southeast, With Special Reference to Quail, by B. V. Travis (pp. 705–708), and The Distribution of Botulinus Toxin in Duck Sickness Areas, by D. R. Coburn and E. R. Quortrup (pp. 869–876) (both U. S. D. A.); The Natural Occurrence of Shock Disease in Hares, by R. G. Green, C. L. Larson, and D. W. Mather (pp. 877–881) (Univ. Minn. and U. S. D. A.); Deer in Relation to Fever Tick [the Cattle Tick] Eradication in Florida, by J. E. Shillinger (pp. 882–885), and Malignant Edema in Deer, by F. D. McKenney (pp. 886–889) (both U. S. D. A.); Enlarged Spleen in Whitetail Deer at Glacier National Park, by J. F. Aiton (pp. 890–892); Observations on Diseases of Bighorn [*Ovis canadensis canadensis*] in Rocky Mountain National Park, by M. K. Potts (pp. 893–897); and Sarcosporidiosis [*Sarcocystis* sp.], a Protozoan Disease of Wildlife, by J. E. Shillinger and P. W. Wetmore (pp. 898–901) (U. S. D. A.).

The mammals of China and Mongolia, I, G. M. Allen (*New York: Amer. Mus. Nat. Hist., 1938, pt. 1, pp. XXV+620, pls. 9, figs. 23*).—This is said to be the first of a 2-volume work, and deals systematically with more than 250 forms of mammals occurring in China and Mongolia. Tables for the separation of the orders, families, genera, and species are included. Section 3 of the present volume consists of a bibliography of 40 pages.

The habits and life history of the eastern chipmunk (Tamias striatus lysteri), E. G. Allen (*N. Y. State Mus. Bul. 314 (1938), pp. 122, figs. 43*).—Report is made of a study of the life history and bionomics of *T. striatus lysteri*, based upon observations by the author and a review of the literature, a nine-page list of which is included.

The rat and ratproof construction of buildings, B. E. Holsendorf (*Pub. Health Rpts.* [*U. S.*], *Sup. 131 (1937), pp. III+68, pls. 2, figs. 45*).—This contribution is accompanied by specifications, drawings (by P. W. Clark), and photographs and a model ratproofing ordinance.

Food habits of Iowa skunks in the fall of 1936, L. F. Selko. (Iowa Expt. Sta.). (*Jour. Wildlife Mangt., 1 (1937), No. 3–4, pp. 70–76*).—The author reports having found the fall food habits of the striped skunk (*Mephitis mesomelas avia*) and the spotted skunk (*Spilogale interrupta*) to differ considerably. The data presented in table form indicate that the striped skunk was the greater insect feeder of the two, having in fact consumed twice as many insects. Of the separable arthropod remains grasshoppers, crickets, and white grubs constituted 52 percent of the total food of the striped skunk, but only 27 percent of that of the spotted skunk.

According to the bulk percentage of mammal remains in the scats the spotted skunk ate four times as much of this class of food as the striped skunk. In both cases meadow mice made up the majority of the mammals eaten—56.8 percent in the striped skunk and 66.99 percent in the spotted skunk. In bulk percentages the spotted skunk ate about five times as many meadow mice as did the striped skunk. The spotted skunk ate cottontails to the extent of 5 percent of the total food remains; the striped skunk only 1.37 percent.

The spotted skunk is shown to have taken approximately four times as much bird matter as the striped skunk, namely, to the extent of 25 percent of its food. The main items concerned, however, blue-winged teal and mallard, were all consumed by two skunks, which probably ate the ducks as carrion, thus in reality conferring a benefit by serving as scavengers. Of the 6.37 percent bird matter eaten by the striped skunk, 4.16 percent was chicken remains, also believed to have been carrion.

Vegetable matter was eaten to a greater extent by the striped skunk than by the spotted, but in both cases the amount was less than 5 percent of the total food remains.

Some observations on fall and winter food patches for birds in southern Michigan, D. L. Allen (*Wilson Bul., 50 (1938), No. 1, pp. 42–46*).—Data obtained from two winters' studies of experimental plantings near Battle Creek, Mich., have shown that where it is desired to produce a supply of food that will be available to pheasants and quail throughout the winter corn is probably the only grain that can be depended upon.

Life histories of North American birds of prey.—II, Orders Falconiformes and Strigiformes, A. C. Bent (*U. S. Natl. Mus. Bul. 170 (1938), pp. VIII+482, pls. 92*).—This second part (E. S. R., 77, p. 654) deals with birds of the orders Falconiformes and Strigiformes.

Life history, habits, and food of the sage grouse (Centrocercus urophasianus Bonaparte), G. L. GIRARD (*Wyo. Univ. Pubs., 3 (1937), No. 1–2, pp. 1–56, figs. 20*).—An investigation of the life history, habits, and food of the sage grouse, which is found in only eight States and is the leading game bird in Montana, Wyoming, Idaho, and Colorado, is reported, the details being given in tables. A bibliography of 14 titles is included.

Winter and spring studies of the sharp-tailed grouse in Utah, W. H. MARSHALL and M. S. JENSEN (*Jour. Wildlife Mangt., 1 (1937), No. 3–4, pp. 87–99, pl. 1, figs. 4*).—Data on the ecology of the Columbian sharp-tailed grouse (*Pedioecetes phasianellus columbianus*) gathered in the northern part of Utah during the years 1935, 1936, and 1937 are presented. It is said that at the present time there are approximately 1,500 of these birds in the State, scattered in small groups through the northernmost five counties. Their food preferences are apparently largely influenced by availability.

A summary of an economic study of the food of the ring-neck pheasant in South Dakota, H. C. SEVERIN (*S. Dak. Acad. Sci. Proc., 16 (1936), pp. 44–58*).—This contribution is based upon investigations a detailed report of which has been noted (E. S. R., 76, p. 651).

[Contributions on economic insects and insect control] (*Mass. Fruit Growers' Assoc. Rpt., 42 (1936), pp. 31–33, 91–96*).—Contributions not previously noted include Fruit Insects in Massachusetts During 1935, by A. I. Bourne and W. D. Whitcomb (pp. 31–33); and Honey Bees in the Orchard, by E. F. Phillips (pp. 91–96, 141–143).

[Contributions on economic insects and insect control] (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1936, pp. 75–123*).—Contributions here presented include the following: A Summary of Fruit Spraying Programmes, I, by H. G. H. Kearns and R. W. Marsh (pp. 75–89); The Control of the Insect Pests of Nursery Fruit Stock, by H. G. H. Kearns and E. Umpleby (pp. 90–98); Combined Washes—Progress Report, III, by H. G. H. Kearns, R. W. Marsh, and H. Martin (pp. 99–117), which considers the fungicidal and phytocidal properties of lime-sulfur—petroleum oil sprays, and hydrocarbon oils as supplements for rotenone-containing insecticides, the details being given in seven tables; and The Use of Sulphite Lye as an Emulsifier, by H. G. H. Kearns and H. Martin (pp. 118–123).

[Work in entomology by the Georgia Station] (*Georgia Sta. Rpt. 1938, pp. 65–71*).—The work briefly reviewed (E. S. R., 78, p. 659) relates to the cowpea curculio, corn earworms in tomatoes, miscellaneous insects at light traps, *Callarctia* (*Apantesis*) *phyllira* Drury, the granulate cutworm, the variegated cutworm, the southern corn rootworm, the vegetable weevil, and *Listroderes apicalis* Wath.

[Work in entomology by the Puerto Rico Station] (*Puerto Rico Sta. Rpt. 1937, pp. 27–37, 56–62, 63, 67–69, 71, 72, 92–103*).—The work of the year referred to (E. S. R., 78, p. 511) includes ways of diminishing damage by the powder-post beetle *Dinoderus minutus* (F.) to bamboo (*Bambusa* spp.); testing of six varieties of bamboo for susceptibility to this powder-post beetle; scale insects (*Asterolecanium bambusae* (Bdv.), *A. miliaris* (Bdv.), and *Chaetococcus bambusae* (Mask.)) as enemies of bamboo and a coccinellid beetle predator (*Chilocorus* sp.) of scale brought from Jamaica; the lesser cornstalk borer as a pest of lima beans, garden peas and cowpeas, and sweet corn; the yellow-striped armyworm as a pest of garden peas; the melonworm injury to calabaza, muskmelons, and cucumbers; bean pod borers (*Maruca testulalis* (Geyer), the Caribbean pod borer, and the lima bean pod borer) as a factor in abscission of buds, blossoms, and young pods; the bean leafhopper *Empoasca fabalis* DeL. as a severe pest of lima beans, especially the small-seeded varieties, and their effective control by a pyrethrum-soap spray when repeated applications were made at 10-day intervals; tests of insecticidal plants, in which leaves and stems of *Tephrosia vogelii* gave a positive reaction to the Durham test and *Lonchocarpus* spp. and *Derris* spp. were promising as rotenone producers; pod borer (*Brachyacma palpigera* (Wlsm.) and the lima bean pod borer) infestation of *T. toxicaria;* the control of the fulgorid vine hopper *Ormenis marginata* (Brunn.), by a parasitic fungus (*Isaria* sp.); leaf webber *Lamprosema indicata* (F.) and skipper larvae of *Acolastus amyntas* (F.) infesting *Derris elliptica*; larvae of a tiger moth, *Ecpantheria icasia* (Cram.), which were destructive to vanilla leaves; the rhinoceros beetle *Strategus oblongus* (Beauv.) as a slight pest of coconut palms; the liberation of *Gambusia holbrooki*, a mosquito-eating fish, in two reservoirs on the station grounds; and biological control, including the introduction from Hawaii of a pupal parasite, *Dirhinus giffardii* Silv., of the Mediterranean fruitfly to aid in the control of *Anastrepha* spp., the collection of six species of native parasites reared from *Anastrepha* spp. and the finding that *Opius anastrephae* was the only one which was effective, parasites of the sugarcane borer (including the native beneficial species *Lixophaga diatraeae* (Towns.)), coconut scale (*Aspidiotus destructor* Sign.) predators and parasites (E. S. R., 79, p. 226), a parasite (*Prospaltella berlesei* (How.)) of the white peach scale on papaya (E. S. R., 79, p. 229), two beneficial insects (*Hambletonia pseudococcina* Comp. and *Anagyrus coccidivorus* Doz.) parasitic on the pineapple mealybug, the rearing of *Dasyscapus parvipennis* Gahan (introduced via Trinidad from the Gold Coast) from the red-banded thrips and its shipment to the United States and successful rearing from the greenhouse thrips, the receipt of *Copris incertus prociduus* (Say) and *Spalangia philippinensis* Full. from Hawaii to combat the hornfly and the rearing of native parasites from the housefly and the hornfly, the recovery of pink bollworm parasites (*Exeristes roborator* (F.)) and *Chelonus blackburni* Cam.), the introduction of *Plaesius javanus* Erich. from Fiji to combat the banana root borer, control of the fall armyworm by four species of native wasps, the shipment of larvae of white grub predators (*Pyrophorus luminosus* Ill.) to Mauritius, and control of white grubs (*Phyllophaga* spp.) by the giant toad (*Bufo marinus*).

The most harmful insects in South Dakota during the year 1936, H. C. Severin (*S. Dak. Acad. Sci. Proc., 17 (1937), pp. 53–59*).—A brief summary of information on the more important insects of South Dakota in 1936.

Report of Provincial entomologist, M. H. Ruhmann (*Brit. Columbia Dept. Agr. Ann. Rpt., 31 (1936), pp. 46, 47*).—The occurrence of and control work with economic insects in British Columbia in 1936 is briefly reported upon.

Insects and allied parasites injurious to livestock and poultry in Canada, E. Hearle (*Canada Dept. Agr. Pub. 604 (1938), pp. 108, figs. 83*).—A practical summary of information on insects and allied parasites of domestic animals and means for their control in Canada, which replaces that by Hadwen previously noted (E. S. R., 50, p. 453).

Insects in Philippine folklore, L. B. Uichanco (*Philippine Agr., 26 (1937), No. 6, pp. 485–499, figs. 4*).—A contribution from the Philippine Experiment Station.

Control for leaf insects [of tobacco] this season (*Tobacco, 106 (1938), No. 13, pp. 94, 96*).—A contribution prepared by the recommendations committee of the Tobacco Insect Council, representing the agricultural experiment stations located in the principal tobacco-producing States and the U. S. D. A. Bureau of Entomology and Plant Quarantine.

A review of progress in vegetable insect control, G. F. MacLeod (*Veg. Growers Assoc. Amer. Ann. Rpt., 1937, pp. 50–59*).—A practical contribution presented at the annual meeting of the Vegetable Growers Association of America, held in New York City in December 1937.

Spiders and insects found associated with sweet corn, with notes on the food and habits of some species.—I, Arachnida and Coleoptera, R. T. Everly (*Ohio Jour. Sci., 38 (1938), No. 3, pp. 136–148, fig. 1*).—Report is made of the results of collections of spiders and insects found upon the corn plants or upon the ground in the corn field during the months of June, July, and August 1935 in the course of field work with the European corn borer at Toledo, Ohio.

[Contributions on fruit insect control] (*Mich. State Hort. Soc. Ann. Rpt., 67 (1937), pp. 21–25, 34–38, 99–106*).—Contributions presented include the following: Spraying Material Combinations That Favor Arsenical Injury on Apples, by W. C. Dutton (pp. 21–24), and First Brood Codling Moth and the Use of Non-lead Sprays (pp. 34–37) and Pesky Peach Pests of 1937 and What to Do About Them in 1938 (pp. 99–102), both by R. Hutson.

[Contributions on tree pests] (*Mass. Forest and Park Assoc., Tree Pest Leaflets 11 (1937), pp. [4], figs. 2; 12, pp. [4], figs. 2; 13, pp. [4], figs. 2; 14, pp. [4], figs. 3; 15, pp. [4], fig. 1; 22 (1938), pp. [4], figs. 2; 24, pp. [4], figs. 2; 25, pp. [4], fig. 1*).—Leaflet 11 (E. S. R., 77, p. 659) relates to The Fir Bark Louse *Adelges piceae* Ratz, by H. J. MacAloney; 12, The Larch Case-Bearer (*Coleophora laricella* Hbn.), by J. V. Schaffner, Jr.; 13, The Pales Weevil (*Hylobius pales* Herbst), by H. B. Peirson; 14, Eastern Spruce Bark Beetle (*Dendroctonus piceaperda* Hopkins), by R. W. Nash; 15, Pine Sawflies (Tenthredinidae), by J. V. Schaffner, Jr.; 22, Red Spiders (*Tetranychus bimaculatus* and *Paratetranychus* sp.), by P. Garman; 24, The Pine Spittle Bug *Aphrophora parallela* Say, by H. K. Henry, E. W. Littlefield, and H. L. McIntyre; and 25, The Gypsy Moth (*Porthetria dispar* (L.)), by A. F. Burgess.

Derris versus cube: Is cube equal to derris as an insecticide? R. C. Roark (*Soap, 14 (1938), No. 1, pp. 111–113, 120*).—In this discussion, presented with a review of the literature, laboratory and field tests are said to indicate that in the control of some insects derris gave better results than cube of the same rotenone content, whereas other insects appeared equally susceptible. The apparent superiority of derris over cube may be due to its finer particle size and to a higher rotenone content than is shown by analysis.

The biological disposition of rotenone after ingestion by the southern armyworm, P. A. Woke. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *57 (1938), No. 9, pp. 707–712*).—Experiments conducted with a view to determining the biological disposition of rotenone after ingestion by the southern armyworm are reported. In this work, in which sixth instar larvae that had been reared on turnip plants and cut lettuce were used, rotenone was fed to the larvae in sandwiches, and after intervals of time acetone extracts of the tissues, gut contents, and feces were prepared and tested against mosquito larvae (*Culex fatigans* Wied.) for the determination of toxicity. "The results show that the southern armyworm larva, after ingesting 5 mg of rotenone, eliminates all or most of the substances with its feces. This result was substantiated by chemical tests. It was also shown that the toxicity of finely powdered rotenone to mosquito larvae is not altered to a demonstrable extent after 18 hours' incubation in the dark at 29° C. with the various tissues or with the contents of the digestive tract."

The incorporation of direct with protective insecticides and fungicides, II. III, E. Fajans and H. Martin (*Jour. Pomol. and Hort. Sci., 15 (1937), No. 1, pp. 1–24; 16 (1938), No. 1, pp. 14–38, pl. 1, figs. 2*).—Part 2 of this contribution (E. S. R., 76, p. 198) deals with the effects of spray supplements on the retention and tenacity of protective deposits; part 3, factors affecting the retention and spray residue of emulsions and combined emulsion suspensions. The contributions are accompanied by lists of 6 and 18 references to the literature, respectively.

Combined washes, [I], II, H. G. H. Kearns, R. W. Marsh, and H. Martin (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpts., 1934, pp. 109–125; 1935, pp. 37–48*).—The first contribution is a progress report upon experiments conducted during the season of 1934 on apple, currant, and plum with combined insecticide-fungicide washes. The second contribution reports upon a series of field tests of combined washes conducted in 1935, along the same lines as in the preceding year, including hydrocarbon oils in combination with lime-sulfur on black currants and apples and derris extracts in combination with lime-sulfur in control of the apple capsid (*Plesiocoris rugicollis*) and apple sawfly (*Hoplocampa testudinea* Klug).

The later experiments confirmed the earlier finding that a "wash consisting of refined white oil (98 percent unsulfonated residue) at 5 percent concentration plus 8 percent lime-sulfur can safely be applied to black currants just before the flowers open. A wash of similar concentration but containing a less refined oil (74 percent unsulfonated residue) applied at the same time caused serious injury. A refined white oil at 5 percent concentration emulsified with sulfite lye and mixed with 3 percent lime-sulfur was applied without damage to several apple varieties at the 'green-flower' stage. The control of apple capsid obtained by this application was not consistent. Rotenone at 1.2 oz. per 100 gal. and derris root at 2.5 lb. per 100 gal., as constituents of lime-sulfur-wetter combined washes, proved practically as effective as nicotine at 8 oz. per 100 gal. in the control of apple sawfly. Nicotine and derris controlled apple sawfly by acting as stomach poisons when applied up to 8 days before egg hatch. There was no evidence that nicotine acted as an ovicide."

Investigations on egg-killing washes: The ovicidal properties of lauryl rhodanate, H. G. H. Kearns and H. Martin (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1935, pp. 49–57*).—Lauryl rhodanate was found during the course of two seasons' laboratory tests to be highly toxic to the eggs of *Anuraphis pomi*, being more ovicidal at concentrations of the order of 0.4 percent than high-boiling neutral tar oil at 2 percent. "The ovicidal efficiency of lauryl rhodanate is unimpaired by solution in petroleum oil and by emulsification with Agral S. R. or by the two-solution oleic acid method. Preliminary trials have indicated that lauryl rhodanate is toxic to eggs of *Psyllia mali* at concentrations effective against aphid eggs. A preliminary field trial of the combined lauryl rhodanate-petroleum wash has confirmed the general ovicidal efficiency of the wash and has demonstrated that it caused no injury to the sprayed trees."

Investigations on egg-killing washes.—II, The ovicidal properties of hydrocarbon oils on Aphis pomi De Geer, H. G. H. Kearns, H. Martin, and A. Wilkins (*Jour. Pomol. and Hort. Sci., 15 (1937), No. 1, pp. 56–68*).—In continuation of the work above noted a description is given of a laboratory method for comparing ovicidal properties, employing eggs of the apple aphid as test material. By this method the ovicidal properties to the apple aphid of hydrocarbon oils are determined by their content of high boiling neutral oils soluble in dimethyl sulfate. There is no evidence of large differences in the ovicidal properties of high boiling neutral oils soluble in dimethyl sulfate derived from various sources.

Laboratory methods for the biological testing of insecticides.—I, Methods of testing ovicides, W. Steer (*Jour. Pomol. and Hort. Sci., 15 (1938), No. 4,* *pp. 338–355, pls. 2, figs. 2*).—This contribution from the East Malling Research Station reports upon methods for testing ovicides in which the eggs of *Orgyia antiqua* L., *Operophtera brumata* L., the apple aphid, and, to a less extent, *Oligonychus ulmi* Koch were used.

A comparative study of some dehydration and clearing agents, P. Ralph (*Stain Technol., 13* (*1938*), *No. 1, pp. 9–15*).—Account is given of an experiment conducted with a view to determining "the advantages of dioxane, isobutyl alcohol, tertiary butyl alcohol, and ethyl alcohol as dehydrants and chloroform, toluol, xylene, benzol, methyl benzoate, methyl salicylate, and acetone as clearers. . . . Materials fixed in Bouin's fluid, Zenker formol, and 10 percent neutral formalin were dehydrated, embedded, sectioned, and stained. Bouin's fluid produces less hardening, shrinkage, and distortion than the other fixatives employed. Slow dioxane is the best method of dehydration. All the picric acid need not be removed from tissues to be embedded in paraffin. Tissue blocks not more than 4 mm thick may be dehydrated and impregnated with paraffin by slow dioxane in 13 hr., fast dioxane in 10 hr., isobutyl alcohol and tertiary butyl alcohol in 14 hr., and ethyl alcohol-chloroform in 17 hr. without incurring any distortion due to rapidity of dehydration and infiltration."

The newer detergents, C. E. Mullin (*Soap, 13* (*1937*), *No. 11, pp. 30, 33, 74*).—This is the first of a series of contributions on recent developments and patents in wetting, emulsifying, and detergent agents.

Lizards in insect control, G. F. Knowlton. (Utah Expt. Sta.). (*Ohio Jour. Sci. 38* (*1938*), *No. 5, pp. 235–238*).—Notes are given on the food of nine species of lizards collected in Utah.

Goniodes centrocerci, a new mallophagan from grouse, F. Simon. (Wyo. Expt. Sta.). (*Jour. Kans. Ent. Soc., 11* (*1938*), *No. 3, pp. 104–108, figs. 4*).—A description is given of *G. centrocerci* n. sp. It and *Lagopoecus perplexus* Kellogg & Chapman were the only two species of Mallophaga taken from Montana and Wyoming sage grouse (*Centrocercus urophasianus*) examined during the last several years by the Wyoming Station.

Grasshoppers in Iowa in 1936, C. J. Drake and G. C. Decker. (Iowa Expt. Sta.). (*Iowa Acad. Sci. Proc., 44* (*1937*), *pp. 189–192, fig. 1*).—A brief report on the occurrence of grasshoppers in Iowa in 1936, in which year tremendous losses were sustained.

The relation of Texas Acrididae to plants and soils, F. B. Isely (*Ecol. Monog., 8* (*1938*), *No. 4, pp. 551–604, figs. 7*).—This report of studies is presented with a list of 42 references to the literature.

Spotting of bananas caused by Frankliniella insularis (Franklin), F. A. Squire and A. K. Briant (*Trop. Agr.* [*Trinidad*], *14* (*1937*), *No. 12, pp. 351, 352*).—A spotting injury to young banana fruit in St. Vincent is said to have resulted from their selection by the common West Indian flower thrips *F. insularis* as an ovipositing medium. The serious injury caused is considered to have been due to the spread of the thrips from swordbeans, *Gliricidia*, and pigeonpeas grown in or near the banana field.

Control of the squash bug, J. L. Hoerner (*Jour. Colo.-Wyo. Acad. Sci., 2* (*1937*), *No. 2–3, pp. 80, 81*).—In cage and field tests with the squash bug adults, Dry Pyrocide (a stabilized pyrethrum), mixed 1 part by weight to 5 parts of reground gypsum, gave practically 100 percent kill of those hit by the dust. To protect squash plants for about 8 weeks through the summer, from 12 to 18 applications of dust costing about $25 per acre would be required.

The comparative attractiveness of various small grains to the chinch bug, C. Benton and W. P. Flint (*U. S. Dept. Agr. Circ. 508* (*1938*), *pp. 8*).—Field observations made in northern Illinois during the spring and early summer seasons of 1934, 1935, and 1936 and in west-central Illinois in 1937 have shown that the preferences of chinch bugs migrating from winter quarters vary with the weather during the spring and with the growth of the small grains. In 1934 rye and winter wheat were the crops preferred, but in 1935 spring barley ranked highest in attractiveness, although spring wheat was heavily infested, as were also rye and winter wheat. In 1936 the relative infestation in the different grains was similar to that of 1935. In 1937 rye averaged highest, with winter wheat, spring barley, and winter barley about equally infested, and spring wheat decidedly lower in general infestation. Oats were least attractive throughout the study, although some fields showed spots of heavy infestation even in areas where the preferred grains were present. No small grain was so unattractive to the bugs that exclusive planting of it could be depended on to prevent severe spring infestations by overwintered adults, development of their progeny in large numbers, and subsequent migrations to adjacent corn, nor was any small grain sufficiently more attractive than the others to be considered a dependable trap or concentration crop.

The biology of Corythucha aesculi O. & D. (Hemiptera, Tingitidae) on the yellow buckeye (Aesculus octandra Marsh), W. C. STEHR (*Ohio Jour. Sci., 38 (1938), No. 1, pp. 13–24, figs. 3*).—A study of the life history of the lacebug *C. aesculi* on yellow buckeye, made over a period of 5 yr., is reported. The data are summarized for each stage of development, the details being given in 10 tables. The injury caused by this insect to the leaves of young buckeye trees results in their dropping in midsummer.

Revision of the Nearctic leafhoppers of the tribe Errhomenellini (Homoptera: Cicadellidae), P. W. OMAN (*U. S. Natl. Mus. Proc., 85 (1938), No. 3036, pp. 163–180, pls. 2*).—Of the five genera of this tribe of leafhoppers recognized, three are here erected. Little is known concerning the food-plant association of the members of the tribe which are confined to the western part of the United States. Those of the genus *Errhomus* (n. g.) appear to be restricted to the *Artemisia* belt, *Pagaronia* and *Lystridea* occur in the coastal chaparral association, while *Friscanus friscanus* (n. g.) is apparently confined to *Lupinus arboreus*.

Entomological contributions to the study of the sugar-cane froghopper, A. PICKLES (*Trop. Agr. [Trinidad], 15 (1938), No. 3, pp. 56–65, pls. 4*).—This third contribution (E. S. R., 70, p. 654) deals with certain Neotropical species of the genus *Tomaspis* and is presented with a list of 21 literature references.

A note on pyrethrum as a possible insecticide for the control of the sugar-cane froghopper, A. PICKLES (*Trop. Agr. [Trinidad], 15 (1938), No. 4, pp. 75, 76*).—Tests of pyrethrum in Diesel oil and in kerosene and of pyrethrum dust for the control of the sugarcane froghopper were found sufficiently encouraging to justify trial on a larger scale.

The seventeen year cicada, alias locust, E. A. ANDREWS (*Quart. Rev. Biol., 12 (1937), No. 3, pp. 271–293*).—Observations of the biology of the periodical cicada at Baltimore, Md., are reported upon.

The control of the greenhouse whitefly in Canada by the parasite Encarsia formosa Gahan, J. H. MCLEOD (*Sci. Agr., 18 (1938), No. 9, pp. 529–535*).—Investigations and observations conducted at the Dominion Parasite Laboratory at Belleville, Ont., during the past 9 yr. are said to have shown that the greenhouse white fly can be controlled by the parasite *E. formosa*. This chalcid parasite was first recorded in 1934, when it was described by Gahan from specimens taken in Ohio (E. S. R., 53, p. 561). Life history and habits studies and the development of technic for distribution under English conditions, based upon work at the Cheshunt Experiment Station, were reported by Speyer in 1927 and 1929 (E. S. R., 60, p. 650; 61, p. 356). Parasites obtained from the Farnham House Laboratory were released in Canada in 1928, at which time a survey showed that it was already present in a number of greenhouses. Its practical value has been demonstrated by its effective control of the greenhouse white fly on many varieties of plants and over a wide range of greenhouse conditions. Its use is increasing and should continue to increase as growers become more familiar with its use and possibilities.

Generic characteristics of Aonidiella Berlese and Leonardi and a description of a new species from Australia (Homoptera-Diaspididae), H. L. McKenzie. (Calif. Citrus Expt. Sta.). *(Pan-Pacific Ent., 13 (1937), No. 4, pp. 176–180, fig. 1).*—The species *A. eremocitri*, a coccid taken in Australia in 1931, is described as new. A table is given for the identification of six species, and notes are presented on the generic characteristics of the genus, of which the California red scale is the type.

The genus Aonidiella (Homoptera, Coccoidea, Diaspididae), H. L. McKenzie *(Microentomology, 3 (1938), No. 1, pp. 36, figs. 16).*—This further contribution (see above) brings together all the known species of diaspidine scales of the genus, 17 in number, 12 of which, including *A. inornata* n. sp., are figured by the author. A key to the species of the genus and a map showing the probable natural distribution of members of this important group are presented. A section on their geographical distribution, by G. F. Ferris, is appended.

The control of woolly aphid (Eriosoma lanigerum Hausm.) on nursery trees, H. G. H. Kearns and E. Umpleby *(Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1935, pp. 67–75, pl. 1).*—In control experiments with the woolly apple aphid infesting nursery stock the immersion of bushes in 10 percent tar-oil emulsion did not give complete control, 14.5 percent of the trees being infested after treatment. "A preliminary experiment in which nursery stock was immersed in hot water at 110° F. for 30 min. provided 98 percent clean stock in mid-June, and the treated bushes made better growth than comparable controls, presumably on account of the absence of pests. The application of a refined kerosene (paraffin) to the stems and side shoots of standard cider trees caused serious injury. Spray applications of a refined, white oil emulsion (1 percent oil) in conjunction with nicotine (8 fluid oz. to 100 gal.) at an interval of 10 days in the summer effected a 40.6 percent reduction in an infestation."

The alimentary canal of the aphid Prociphilus tesselata Fitch, J. Z. Pelton. (Ohio State Univ.). *(Ohio Jour. Sci., 38 (1938), No. 3, pp. 164–169, figs. 10).*—A description is given of the gross anatomy of the digestive tract and of the histology of the alimentary canal of the woolly alder aphid.

The aphid genus Microsiphum in Utah and Idaho, C. F. Smith and G. F. Knowlton. (Utah Expt. Sta.). *(Ann. Ent. Soc. Amer., 31 (1938), No. 2, pp. 162–166, figs. 15).*—The species *M. artemisiae* (Gill.) and *M. oregonensis* Wilson are noted, and *M. acophorum* from *Artemisia tridentata* in Utah, Idaho, and Colorado is described as new.

The ornate aphid, new to North America, Myzus ornatus Laing, E. O. Essig *(Pan-Pacific Ent., 14 (1938), No. 2, pp. 92–95, fig. 1).*—The exotic aphid *M. ornatus*, described by F. Laing from specimens collected from the violet at Devon, near Dawlish, England, in February 1932, is reported by the author as having been found on several host plants at Berkeley, Calif., and on heliotrope at Los Angeles. Illustrated descriptions are given of both the apterous and the alate viviparous female.

Control of aphis on apples and sweet cherries, W. C. DUTTON (*Mich. State Hort. Soc. Ann. Rpt., 66 (1936), pp. 36–39*).—A practical contribution.

Moths invade play area, J. E. PATTERSON (*West. Trees, Parks & Forests, 1 (1938), No. 2, p. 7, figs. 3*).—Reference is made to the occurrence of Oslar's tussock moth *Hemerocampa oslari* Barnes, which recently appeared in the Mammoth Lakes region of the Inyo and Mono National Forests on the east flank of the Sierra and threatens considerable damage to the fir and pine forest cover. In this infestation, first noticed in the fall of 1936, white fir (*Abies concolor*) is the preferred host but Jeffrey pine (*Pinus jeffreyi*) which occurs in an infested area is also attacked; red fir (*A. magnifica*) has not been attacked, although it is present in some of the infested white fir stands. The infestations of this moth have not spread far from the original centers during the 3 yr. of their existence. Wilt disease became epidemic in the brood of 1937 and accounted for a high mortality in the prepupal caterpillars.

A report on the presence of the coconut zygaenid Artona catoxantha Hamps. in the Province of Palawan, G. MERINO (*Philippine Jour. Agr., 9 (1938), No. 1, pp. 31–37, pl. 1*).—This account relates to a destructive pest of coconut heretofore not reported from the Philippines that has been found to infest groves in Palawan.

An analysis of the blood of the sixth-instar southern armyworm (Prodenia eridania), F. H. BABERS. (U. S. D. A.) (*Jour. Agr. Res. [U. S.], 57 (1938), No. 9, pp. 697–706*).—An analysis made of the blood (hemolymph) of the mature sixth instar larvae of the southern armyworm is reported. A brief description is given of some of its physical properties, namely, approximate blood volume, color, density, osmotic pressure, and pH value. A list of 37 references to the literature is included.

Notes in the natural control of the fall webworm in Colorado, R. B. SWAIN (*Jour. Colo.-Wyo. Acad. Sci., 2 (1937), No. 2–3, pp. 43, 44*).—Attack of the fall webworm by the egg parasite *Trichogramma minutum* Riley and by six species of ichneumonids and two tachinids at Fort Collins, Colo., is reported upon. The ichneumonids *Meteorus acronyctae* Mueseb. and *Hyposoter pilosulus* Prov. were found the most important.

Orchard sanitation for codling moth control, A. M. WOODSIDE. (Va. Expt. Sta.). (*Va. Fruit, 26 (1938), No. 2, pp. 12, 14, 16*).—A practical contribution.

A theory of diapause in Platyedra gossypiella Saund., F. A. SQUIRE (*Trop. Agr. [Trinidad], 14 (1937), No. 10, pp. 299–301, pl. 1, fig. 1*).—The author concludes that "the apparent hibernation or estivation of the pink bollworm is really a case of diapause and is induced by dry and/or rich food toward the end of the crop irrespective of the time of the year at which this takes place. The field conditions leading up to this position are (1) the increase in the ratio of ripe to green bolls, and (2) a sufficiently high incidence of the pest to necessitate the infestation of ripe and ripening bolls. From observations on infested cotton bolls and ochroe pods, it appears that only those larvae which complete their larval development on ripening seeds are liable to go into the resting stage. The addition of water to the tissues of resting larvae in most cases expedites emergence but is not a sine qua non thereof, and in a small percentage of cases fails to terminate the diapause."

The role of airplane dusting in the control of Anopheles breeding associated with impounded waters, R. B. WATSON, C. C. KIKER, and H. A. JOHNSON (*Pub. Health Rpts. [U. S.], 53 (1938), No. 7, pp. 251–263, pls. 4, fig. 1*).—The experiences reported have led to the conclusion that airplane dusting for *Anopheles* mosquito control on impounded waters is a practical, effective, and economical operation when practiced under the conditions described.

Identification and distribution of two simuliids in Virginia, W. R. DeGarmo and G. W. Underhill (*Va. Acad. Sci. Proc., 1937, p. 56*).—In the course of an investigation of the identity and distribution of species of Simuliidae in Virginia, conducted as a part of a project on a leucocytozoon disease of turkeys in that State, as reported by Johnson and Underhill (E. S. R., 78, p. 402), *Simulium vittatum* and *S. hirtipes* were studied and are briefly referred to.

A classification of the larvae and puparia of the Syrphidae of Illinois exclusive of aquatic forms, E. M. Heiss. (Univ. Ill.). (*Ill. Biol. Monog., 16 (1938), No. 4, pp. 142, figs. 146*).—Included in the introductory part to this work are family characteristics of immature Syrphidae, food habits and pupariation, evidence of generic relationships afforded by the larvae, parasites, other larvae resembling Syrphidae, and taxonomy. The main part of the work (pp. 27–98) consists of descriptions and keys to the species of 27 genera. A list of the known parasites of 18 syrphid species and a bibliography of 4 pages are included.

The genus Hodophylax James, with a description of basingeri new species (Diptera; Asilidae), A. E. Pritchard. (Minn. Expt. Sta.). (*Pan-Pacific Ent., 14 (1938), No. 3, pp. 129–131, fig. 1*).

New Therevidae (Diptera) from Utah, D. E. Hardy. (Utah Expt. Sta.). (*Ann. Ent. Soc. Amer., 31 (1938), No. 2, pp. 144–146, figs. 3*).—The genus *Zionea* is erected and two species are described as new.

The second introduction of the Amazon fly from British Guiana into Puerto Rico, K. A. Bartlett (*Puerto Rico Sta. Agr. Notes No. 86 (1938), pp. 4*).—The first attempted introduction of the important Brazilian parasite *Metagonistylum minense* Towns. from British Guiana, as reported by Dohanian (E. S. R., 78, p. 73), having failed, a second attempt is reported upon.

Rearing house flies, C. W. Eagleson (*Soap, 13 (1937), No. 12, pp. 115, 117, figs. 2*).—A description is given of a new method of rearing houseflies which has been developed as a means of producing at small expense large quantities of flies that are uniform in vitality. In simplicity, efficiency, and economy, this method is said to have proved superior to older methods now extensively used. Successive generations which have been reared by the author during two winters have shown no decrease in vitality, and their fecundity has remained unimpaired.

A study of the incidence and habits of Cochliomyia americana by means of flytraps, A. W. Lindquist. (U. S. D. A.). (*Jour. Kans. Ent. Soc., 11 (1938), No. 3, pp. 97–104, fig. 1*).—In the investigation at Uvalde, Tex., here reported, decaying flesh was found to be an important feeding material for the screwworm, and liver-baited fly traps were valuable in the study of the adult population of this pest. The incidence of the screwworm females increased gradually during the spring and showed a rather rapid decline during the hot, dry weather of the summer with a rise again in the fall. During the late winter season the fly population was reduced to the lowest numbers of the year. In general, the fly population followed the incidence of screwworm cases in animals. An average of 20.1 screwworms were caught per day per trap, when liver was used as bait, in the spring and summer of 1936. Trap-caught flies oviposited viable eggs on wounds on animals and lived an average of 3.4 days after being taken out of traps. The majority of the flies caught over liver bait were indicated to be in the preoviposition stage, while those caught on wounds were apparently ready for oviposition.

A practical trap for the control of horn flies on cattle, W. G. Bruce. (U. S. D. A.). (*Jour. Kans. Ent. Soc., 11 (1938), No. 3, pp. 88–93, figs. 3*).—A description is given of a fly trap which gives promise of effective control of the horn fly and of greatly reducing the population of the stablefly. This fly trap is of simple construction and can be built at a relatively small cost.

Flea infestation of domestic rats in San Francisco, Calif., C. R. Eskey (*Pub. Health Rpts. [U. S.], 53 (1938), No. 23, pp. 948–951*).—The studies reported have shown that the domestic rats (*Rattus norvegicus* and *R. rattus*) of San Francisco act as the natural hosts for three species of rodent fleas, the oriental rat flea, the rat flea, and *Ctenopsyllus segnis*. Nearly two-thirds of the rats trapped were found flea-infested, a greater percentage of infestation than has been reported for most communities. The widespread dissemination of fleas on San Francisco rats can be accounted for by the fact that, of the two most prevalent species of fleas found on them, one, the oriental rat flea, is particularly adapted to existence on rats having close contact with buildings, while the second, the rat flea, thrives best on rats nesting exterior to buildings.

A note on Melasoma populi L. (Chrysomelidae) as a pest of basket willows, H. G. H. Kearns (*Univ. Bristol. Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1935, pp. 87–90, pl. 1*).—This note relates to the life history and the damage caused by the large chrysomelid beetle *M. populi*, which is at times found in large numbers on poplars but only occasionally occurs in England as a pest of the basket willow. In 1934 and 1935 a severe infestation of a number of species of *Salix* in a willow bed at Athelney, Somerset, led to the observations here reported. It was found that derris was highly toxic to the beetles, and that lead arsenate used in conjunction with a suitable concentration of a wetter killed the larvae.

The sweetpotato leaf beetle, L. W. Brannon. (Coop. Va. Truck Expt. Sta.). (*U. S. Dept. Agr. Circ. 495 (1938), pp. 10, figs. 4*).—Studies of the biology, economic importance, and control of the sweetpotato leaf beetle *Typophorus viridicyaneus* (Crotch) conducted at Norfolk, Va., in 1931, 1932, and 1933 and supplemented by field observations in Currituck County, N. C., during the seasons 1931 to 1936, inclusive, are reported. This leaf-eating beetle has caused some damage to sweetpotatoes periodically in certain localities in the Southern States. Passing the winter in the larval stage in the soil, pupation commences during the first part of May. The adults begin to emerge during the last part of the month and may be found until about the middle of July. The eggs, some 50 of which are laid during the summer, hatch in about 9 days, the larvae feeding in the vines and roots of the plants. Insecticide tests in cages indicate that undiluted calcium arsenate, 80 percent barium fluosilicate with infusorial earth (1 part to 2 parts, respectively, by weight), and synthetic cryolite (3 parts to 2 parts of talc) are highly toxic to the adult.

Rearing the coccinellid Hippodamia convergens Guer. on frozen aphids, G. W. Haug. (Ohio State Univ.). (*Ann. Ent. Soc. Amer., 31 (1938), No. 2, pp. 240–248, figs. 4*).—It has been found that by the use of frozen aphids egg production by the convergent ladybeetle can be maintained throughout the year. Methods of freezing the aphids and feeding them to the ladybeetle adults have been worked out. Of the various aphids tested, the poplar gall aphid *Pemphigus populitransversus* proved the most satisfactory.

The control of flea beetles by means of a seed dressing.—Progress report, C. L. Walton (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann.* Rpt., *1935, pp. 80–86*).—An attempt to provide a seed dressing which will afford sufficient protection to enable seedling plants of the field cole crops to reach the "rough leaf" stage without serious attacks by flea beetles is reported upon. The dressing used consisted of a "mixture of paradichlorobenzene and naphthalene dissolved in a kerosene, the cost of the ingredients, as purchased, being 5s. 10d. per gallon. The amount used varied between 0.5 and 1 fluid oz. to each pound of seed sown. Used at the higher rate the cost of materials should not exceed 2d. per acre. The dressing has been successful in preventing or reducing flea beetle injuries in a considerable number of the field trials during 1933–35, despite weather conditions which were in many cases very adverse. No case of injury to seed was noted, whilst a feature of the field trials was an appreciable increase in the average number of seedling plants per foot run of drill in the dressed rows as compared with the untreated."

The depletion of starch from timber in relation to attack by Lyctus beetles, I, II (*Forestry, 12 (1938), No. 1, pp. 15–37, pls. 2, fig. 1*).—Two contributions are presented: (1) Starch, With Special Reference to Its Occurrence in Timber, by E. W. J. Phillips (pp. 15–29), and (2) A Preliminary Experiment Upon the Effect of Girdling Standing Oak Trees, by E. A. Parkin (pp 30–37).

The egg-producing capacity of populations of Tribolium confusum Duv. as affected by intensive cannibalistic egg-consumption, J. Stanley (*Canad. Jour. Res., 16 (1938), No. 10, Sect. D, pp. 300–306, figs. 5*).—A description is given of experiments in which adults of the confused flour beetle were maintained at 27° C. and 75 percent relative humidity in four different flour media—(1) ordinary whole wheat flour sifted through 76-mesh bolting cloth, (2) similar flour with from 30 to 135 *Tribolium* eggs per gram, (3) sifted whole wheat flour plus 3 percent of finely ground wheat germ, and (4) flour plus germ plus eggs.

"It is shown that when large numbers of eggs are eaten there is a serious decline in egg production unless wheat germ in excess is also present. This is believed to be due to a scarcity of certain accessory growth substances found in wheat germ but not to the same extent in eggs. When ground wheat germ is present the beetles seem to do somewhat better in the presence of eggs, possibly because of a better water supply obtained from the eggs."

An experiment on the hand-collection of egg-masses of citrus weevils (Diaprepes spp.) in St. Lucia, G. B. Gregory (*Trop. Agr. [Trinidad], 15 (1938), No. 5, pp. 112–114, fig. 1*).—An account is given of an experiment on hand picking of egg masses of citrus weevils (*Diaprepes* spp.) on lime trees 7 to 8 ft. high in St. Lucia. The time and cost of this work was found to be so great that the method is regarded as entirely impracticable, although it is suggested that it might be effective on very young nursery stock.

An annotated list of the insects, mostly Coleoptera, associated with Jeffrey pine in Lassen National Forest, California, W. H. Lange, Jr. (*Pan-Pacific Ent., 13 (1937), No. 4, pp. 172–175*).—A list is given of the insects found on Jeffrey pine in California, arranged in groups according to parts of the tree attacked.

Population studies of Formica exsectoides Forel, E. N. Cory and E. E. Haviland. (Univ. Md.). (*Ann. Ent. Soc. Amer., 31 (1938), No. 1, pp. 50–57, fig. 1*).—Observations of the population of one large nest and one medium-sized nest of the eastern mound-building ant *F. exsectoides* in Maryland are reported. An estimate of 238,510 and 41,366, respectively, was made of the ants inhabiting the 2 colonies.

Crabro davidsoni Sandh., a wasp predacious on adult leafhoppers, R. H. Davidson and B. J. Landis. (U. S. D. A.). (*Ann. Ent. Soc. Amer., 31 (1938), No. 1, pp. 5–8, figs. 3*).—A list of 32 species of leafhoppers, found in the cells of the predaceous wasp *C. davidsoni* in Ohio and representing the genera *Empoasca*, *Typhlocyba*, and *Erythroneura*, is included in this contribution.

Some revisions in the genus Sphex, with one new species, a new subspecies, and a new name (Hymenoptera: Sphecidae), W. D. Murray. (Minn. Expt. Sta.). (*Ann. Ent. Soc. Amer., 31 (1938), No. 1, pp. 17–43, fig. 1*).—

Descriptions of 10 forms and a key for their separation are given in this contribution.

The biology of Cephalonomia tarsalis (Ash.), a vespoid wasp (Bethylidae: Hymenoptera) parasitic on the sawtoothed grain beetle, D. POWELL. (Univ. Ill.). (*Ann. Ent. Soc. Amer., 31 (1938), No. 1, pp. 44–49, figs. 12*).—Observations of a fossorial wasp of the family Bethylidae (*C. tarsalis*), discovered in corn meal at Urbana, Ill., in October 1934 as a parasite of the saw-toothed grain beetle, are reported. It is said that the species is not of economic importance in the control of this pest.

Synonymical notes and new species of Pseudomethoca and Dasymutilla (Mutillidae: Hymenoptera), C. E. MICKEL. (Minn. Expt. Sta.). (*Ann. Ent. Soc. Amer., 31 (1938), No. 2, pp. 147–156*).—Five species are described as new.

Cocoon formation in endoparasitic chalcidoids, S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Ann. Ent. Soc. Amer., 31 (1938), No. 2, pp. 167–180, figs. 6*).—This contribution is presented with a list of 38 references to the literature.

New ants from stomachs of Bufo marinus L. and Typhlops reticulatus (L.), N. A. WEBER (*Ann. Ent. Soc. Amer., 31 (1938), No. 2, pp. 207–210*).—Descriptions are given of five new forms of ants taken from the stomachs of the giant toad (*B. marinus*) and the blind snake (*T. reticulatus*) in British Guiana or Trinidad.

Occurrence of larval and nymphal stages of the rabbit tick (Haemaphysalis leporis-palustris) on wild birds from Cape Cod, C. M. HERMAN (*Bul. Brooklyn Ent. Soc., 33 (1938), No. 3, pp. 133, 134*).—Record is made of the collection of immature stages of the rabbit tick from 6 species of birds, numbering 23 individuals, during a 12-day period at the Austin Ornithological Research Station, North Eastham, Mass.

The ticks of British Columbia, E. HEARLE (*Sci. Agr., 18 (1938), No. 7, pp. 341–354*).—A systematic list of Ixodoidea known or thought to occur in British Columbia, a host list of the ticks of the Province, notes on the species, 22 in number, and a list of 28 references to the literature follow a brief general account of the ticks.

Avian hosts of the genus Isospora (Coccidiida), D. C. BOUGHTON (*Ohio Jour. Sci., 38 (1938), No. 3, pp. 149–163*).—A list is given of avian hosts of the genus *Isospora*. This list includes 177 species and subspecies of birds, representing 130 genera, 40 families, and 9 orders. Ninety-one of the 177 avian hosts are said to be new host records.

ANIMAL PRODUCTION

[Livestock investigations in Georgia] (*Georgia Sta. Rpt. 1938, pp. 47–51, 52, 53, 54, 63 fig. 1*).—Experiments for which results are briefly noted include the comparative values of corn silage, sorghum silage, and No. 1 Spanish peanut hay as roughages for fattening beef cattle; peanut meal v. cottonseed meal for fattening cattle; the value of supplementary concentrate feeding to young beef cattle on pasture; pasture fertilization as a means of improving the mineral intake of cattle; the returns secured from improved and unimproved upland pastures with steers; the value of fertilized permanent pasture for growing young work stock; the effect of various levels of peanut meal in the ration of pigs on the quality of pork; comparison of native, Hampshire, and Southdown blood lines for profitable sheep production; the effect of light (natural and artificial) on the breeding efficiency of sheep; the use of pituitary hormones as a factor in early lamb production; and the fineness of grinding as related to the rate of carotenoid pigment losses in dried pimiento waste.

Report on the organization of animal research in New Zealand, J. Hammond (*New Zeal. Jour. Sci. and Technol., 19 (1938), No. 12, pp. 762–783*).—This report discusses various problems of animal research in New Zealand and offers plans for the organization of research in that country.

The variation in the nutritive value of casein, H. D. Branion, R. L. Martin, E. B. Robertson, L. A. Stephens, and R. van der Hoorn (*Poultry Sci., 17 (1938), No. 4, pp. 301–316*).—The nutritive value of 12 caseins (10 Canadian, 1 Argentine, and 1 New Zealand sample) was determined in a series of chick feeding trials in which these caseins were used as the principal source of protein in each of four types of basal ration. Marked differences in the growth-promoting properties and the ability to prevent the various deficiency symptoms were observed for the various caseins, indicating that some of them were contaminated with riboflavine and the chick antidermatitis factor. Some caseins offered greater protective action against nutritional paralysis than others. The purified casein diets also proved deficient in a factor or factors, probably inorganic in nature, which was associated with poor growth and the onset of arthritis. A differential sex requirement for the vitamin B_2 complex was observed, males having a higher requirement.

The biological processes in the utilization of amides, especially molasses-amides and the proteins of straw, by ruminants, III [trans. title], **W. Klein, H. Schmid, and E. Studt** (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 39 (1937), No. 2, pp. 135–161, pl. 1, figs. 10*).—In the studies reported, growing and mature sheep and pregnant and suckling ewes were maintained in a normal condition on a ration composed of molasses, straw, and pure starch. The biological effects of such a ration (low crude protein and high nonprotein nitrogen) were extensively studied. It is concluded that the utilization of the nonprotein nitrogen in this ration was possible as a result of the action of micro-organisms in the rumen of the animal or symbiotic zymogenesis.

Mineral and nitrogen content of lespedezas and other hay crops in Tennessee, E. K. Weathers (*Tennessee Sta. Bul. 166 (1938), pp. 32, fig. 1*).—The results of 5 years' investigation on the chemical composition of lespedezas, alfalfa, and hop clover as affected by soil, fertilizers, season, and stage of growth are summarized.

For the three varieties of annual lespedeza studied there was generally a larger percentage of leaves than stems. The yields of hay and leaves increased as the plants approached maturity, although the proportion of leaves to stems decreased. The leaves contained about as much potash, 1.6 times as much ash, and twice as much nitrogen as the stems. The ash and nitrogen content of the whole plant tended to decrease as the plant matured. Lespedeza hays from good land contained on the average 23 percent more ash, 22 percent more lime, 30 percent more magnesium, 6 percent more potash, 96 percent more iron oxide, 114 percent more phosphoric acid, 11 per cent more nitrogen, and a much narrower calcium: phosphorus ratio than hays grown on poor soil. The phosphoric acid content of hays from well-fertilized areas averaged about 40 percent higher than those from unfertilized areas of the same soil type, while the calcium content averaged slightly lower in the fertilized hay.

A comparison of samples of *Lespedeza sericea* cut at 12-, 18-, 24-, and 30-in. growth stages showed that the former was highest in total ash, nitrogen, and proportion of leaves to stems, with a gradual decrease in each of these factors as the plant increased in height. The calcium: phosphorus ratio was highest in the 24-in. stage, followed in order by the 18-, 12-, and 30-in. stages. The proportion of leaves to stems and the lime content of the plant reached the highest level in cuttings made late in the season. The highest total annual yields of cured hay were obtained by two cuttings at the 30-in. stage, followed in order by three cuttings at the 24- or 18-in. stages and four cuttings at 12 in. There was a slightly larger proportion of leaves than of stems in alfalfa at each growth stage studied. The leaves contained about 1.5 times as much ash and nitrogen as the stems and were higher in the other constituents, except phosphoric acid and potash. There was little difference in the phosphorus, nitrogen, iron, or manganese content of prebloom- and bloom-stage hays, while the former excelled in ash, lime, magnesium, and also in potash. The phosphorus and nitrogen contents of hop clover were considerably higher in the prebloom and early-bloom stages than in annual lespedezas, but dropped to about the same level as lespedezas in the late-bloom stage.

The carotene content of market hays and corn silage, H. G. Wiseman, E. A. Kane, L. A. Shinn, and C. A. Cary. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], *57* (*1938*), *No. 9, pp. 635–669, fig. 1*).—Methods employed in the determination of carotene in hays, silages, and freshly cut plant material are described and compared with other similar procedures. Under the procedures followed, chlorophylls and xanthophylls were separated from the carotene, but certain other pigments occurred in the carotene fraction. These pigmented impurities, the sources of which were not definitely determined, were shown to account for from 11 to 32 percent of the absorption at a wave length of 450 mμ with extracts from hays and corn silages. Despite this error, however, routine carotene determinations were found to be very useful indexes of vitamin A values of feeds of plant origin used in cattle feedings. Without correcting for this error, the carotene found in milligrams per kilogram was for bluegrass (dry weight), 424–662 (average 567); freshly cut alfalfa (dry weight), 271–412 (average 332); artificially dried alfalfa leaf meals, 76–244 (average 151); corn silage (as fed), 1–40 (average 14); alfalfa hays of grades U. S. No. 1, 2, and 3 in color, 19–121 (average 43), 12–20 (average 15), and 1–11 (average 4), respectively; timothy hays of grades U. S. No. 1, 2, and 3, 8–36 (average 21), 8–11 (average 9), and 1–12 (average 5), respectively; clover hay of grade U. S. No. 1, 11–43 (average 23); corn stover (dry), 2–6 (average 4); and garden carrots (as fed), 36–132 (average 91).

Forty-six references to the literature are cited.

The relative vitamin G content of alfalfa hay, stems, and leaves from 10 inch and 24 inch cuttings, V. Heiman, J. S. Carver, and J. W. Cook. (Wash. Expt. Sta.). (*Poultry Sci., 17* (*1938*), *No. 5, pp. 412–416, fig. 1*).—The vitamin G potency of these alfalfa products was determined by a 3-week experimental growth period with White Leghorn male chicks which had previously been subjected to a 2-week depletion period. Using dried skim milk as a standard with an assigned vitamin G value of 100, the hay, stems, and leaves of the 10-in. alfalfa possessed vitamin G values of 50, 30, and 110, respectively, and those of the 24-in. alfalfa 40, 20, and 100, respectively.

Feeding artificially dried grass, S. J. Watson (*London: Fert. and Feed. Stuffs Jour., pp. 68, fig. 1,*).—This popular report deals with the nutritive value of artificially dried grass, the storage of dried grass, and the formulation of rations including artificially dehydrated grass for various classes of farm animals. Much of the literature on practical and experimental results obtained when artificially dried grass was fed is reviewed.

Methods of ensiling and analysis of green fodder silage [trans. title], K. Gneist (*Landw. Vers. Sta., 128* (*1937*), *No. 5–6, pp. 257–366, figs. 18*).—Extensive trials with various green crops preserved in laboratory silos indicated that such crops when finely chopped may be satisfactorily ensiled without the addition of preservatives when the ratio of crude protein to nitrogen-free extract is equal to or above 1:2. Under these conditions relatively low ensiling temperatures occurred and the pH seldom exceeded 4.2. Plants having a lower ratio of crude protein to nitrogen-free extract were satisfactorily ensiled with additions of acid or molasses. The loss of carbon dioxide increased rapidly as the temperature during ensiling increased, the loss being three times as great at 29° C. as at 18°, with excessive butyric acid formation occurring at the higher temperatures. At pH 4.2 the loss of digestible nitrogen-free extract from carbon dioxide formation did not exceed 10 percent. The rate and sequence of production of various acids in the silage and methods of analysis are fully discussed.

The digestibility of Canadian feeding stuffs.—IV, Raw potatoes, dried potatoes, and soaked dried potatoes, J. C. Woodward, W. M. Davidson, C. J. Watson, C. H. Robinson, and G. W. Muir (*Sci. Agr., 18 (1938), No. 11, pp. 629–640*).—Continuing these studies (E. S. R., 76, p. 670), the coefficients of digestibility of raw, dried, and soaked dried potatoes as determined in trials with grade Shorthorn steers were—dried matter 87.7, 84.7, and 85.2, nitrogen 65, 44.9, and 50.6, and nitrogen-free extract 95.1, 93.4, and 94, respectively. Apparently drying the potatoes had no practical deleterious effect on the availability of the nutrients, and soaking did not increase their nutritive value for beef cattle.

The toxicity of linseed meal, C. M. McCay and A. V. Tunison. (Cornell Univ.). (*Jour. Biol. Chem., 123 (1938), No. 3, pp. lxxx, lxxxi*).—Following the observation that linseed meal was quite toxic to brook trout, it was determined that linseed meal freed from hydrogen cyanide was no longer toxic. Adding starch to the linseed meal diet did not reduce its toxicity. The meal proved toxic when fed with either raw or cooked liver although less so with the latter, suggesting that fresh liver promotes the toxicity but is not a primary source of enzymes for freeing the cyanide in the meal.

Commercial feeding stuffs, 1937–38, E. R. Tobey (*Maine Sta. Off. Insp. 168 (1938), pp. 37*).—This is the usual report of the guarantees and analyses for protein, fat, and fiber of 597 samples of feeding stuffs collected for official inspection during the year ended June 30, 1938 (E. S. R., 78, p. 378).

Commercial feeding stuffs from September 1, 1937, to August 31, 1938, F. D. Fuller and J. Sullivan (*Texas Sta. Bul. 566 (1938), pp. 195*).—Included in this annual report (E. S. R., 78, p. 521) are tabulations of the guarantees and analyses of 3,563 samples of feeding stuffs submitted to chemical analysis and microscopic examination during the year ended August 31, 1938, the results of bio-assay of 24 vitamin D carriers, and hardness tests for 23 samples of cottonseed cake. Separate tables indicate the average composition, digestible protein, and productive energy of many feeding stuffs analyzed, and the average, minimum, and maximum protein content of cottonseed products from each oil mill in the State. Information is included on the chemical standards for various by-products and special-purpose mixed feeds and definitions of and standards for commercial unmixed feeds.

Digestibility studies with ruminants.—III, Plane of nutrition and digestibility of mangels, C. J. Watson, J. C. Woodward, W. M. Davidson, C. H. Robinson, and G. W. Muir (*Sci. Agr., 18 (1938), No. 10, pp. 586–605, fig. 1*).—Continuing these studies (E. S. R., 76, p. 670), the digestibility of mangels was determined when fed alone and in combination with hay to grade Shorthorn steers. In two series of trials the coefficients of digestibility of mangels when fed alone were—dry matter 85.9–86.3, nitrogen 72.5–77, crude fiber 47.7–56.9, and nitrogen-free extract 94.9–95.1. Feeding different levels of mangels in combination with hay did not significantly affect the digestibility of the nutrients, although a tendency for a depression of the digestibility of the protein at the maximum levels of feeding was observed.

A comparison of cottonseed meal, cottonseed meal and tankage, peanut oil meal, and soybean oil meal, fed with corn silage for fattening two-year-old steers, M. Jacob and H. R. Duncan (*Tennessee Sta. Bul. 167 (1938), pp. 7, fig. 1*).—Three separate steer-fattening trials, each of 140 days' duration, were conducted. Corn silage was fed to all groups of steers, the amount fed being governed by the lot consuming the least. The supplements fed in each trial were lot 1, cottonseed meal; lot 2, a cottonseed meal and tankage mixture (3:1); lot 3, peanut oil meal; and lot 4, soybean oil meal. The amount of supplement fed was gradually increased, ranging from 3 lb. per head daily during the first month to 7 lb. per head during the last 20 days.

The average daily gains were very similar for all lots (range 1.735 lb. on peanut meal to 1.822 lb. on soybean oil meal) as was the feed required per 100 lb. of gain (range 2,456 lb. of silage and 267.1 lb. of soybean oil meal to 2,563 lb. of silage and 282.5 lb. of peanut oil meal). The cattle fed peanut oil meal had less keen appetites and were off feed more frequently. Satisfactory slaughter cattle were produced by each ration. Since the four concentrates proved practically equal pound for pound, the price per ton should be the deciding factor in choosing between them.

Comparison of alfalfa and western wheatgrass hays for wintering yearling heifers in the northern Great Plains and their influence on summer gains, A. L. Baker. (Coop. Mont. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 635 (1938), pp. 8*).—Three years' results with yearling Hereford heifers at the Range Livestock Experiment Station at Miles City, Mont., are summarized. In each trial the heifers, which were carried on the range until early January, received either wheatgrass hay or alfalfa hay as a sole ration during a wintering period of approximately 3 mo. This was followed by a period of approximately 200 days on range, at which time the final weight data was recorded. During the first 2 yr. the wheatgrass hay excelled the alfalfa hay in quality, while both lots were of relatively low quality during the third year. The lots fed wheatgrass and alfalfa hays consumed an average of 20 and 22.7 lb. daily, made average daily gains of 40 and 38 lb. per head during the wintering period, and average total gains of 320 and 319 lb. per head during the combined winter-summer period, respectively. The wheatgrass hay valued at the same rate per ton as alfalfa was therefore slightly less expensive from the standpoint of winter feed cost.

Losses of newborn calves presumably the result of feeding dams rations inadequate for reproduction, J. Sampson, L. E. Boley, and R. Graham. (Univ. Ill.). (*Cornell Vet., 28 (1938), No. 1, pp. 53–57*).—This report describes the loss of 84 newborn calves in a large Hereford herd, most of which were from cows confined to a winter ration of wheat straw and yellow ear corn. A brief summary of the histopathological findings and the results of chemical tests are given which were indicative of fatty infiltration of the livers, low serum inorganic phosphorus, low vitamin A storage, and in some cases hypoglycemia. This condition was markedly improved when the herd was changed to a ration of clover hay, mixed concentrates, and minerals.

Relationships among production and grade factors of beef, O. G. Hankins and L. P. Burk (*U. S. Dept. Agr., Tech. Bul. 665 (1938), pp. 40, figs. 23*).—This study, conducted in cooperation with 18 of the State experiment stations, involved a total of 2,073 cattle, included steer calves, yearling steers, 2-year-old steers, and heifer calves, representing a wide range in breeding, grades, rations fed, total gains, and other factors. Each animal was graded as a feeder, as a slaughter animal, and as a dressed carcass by a committee of three according to U. S. market classes and grades of cattle (E. S. R., 57, p. 170). These data were correlated with such factors as age, initial weight, rate of gain, total gain, and final weight.

Data on 914 steer calves indicated that higher initial weight than the grade generally resulted in higher carcass grades when total feed lot gains were equal; more rapid feed-lot gains resulted in higher carcass grade when total gains were equal, except in the case of Fancy steers; the higher the grade for heavier feeders, the greater was the feed-lot gain required to produce a carcass grade corresponding to the feeder grade; and greater total gain was required by lower grade feeders than by higher grade feeders to produce equal carcass grades. With 331 yearling steers both high initial weight and more rapid feed-lot gains for a given feeder grade resulted in somewhat higher carcass grades when total gains were equal; and higher grades required more feed-lot gain than lower grades to produce carcasses of corresponding grade. Records on 349 2-year-old steers indicated that with Choice feeders higher initial weight resulted in higher carcass grade, but with lower grade feeders initial weight had no apparent influence in this respect; rate of gain had little, if any, influence on carcass grade; light Choice feeders required a greater feed-lot gain than heavy Choice or Good feeders to produce a carcass grade corresponding to feeder grade.

In all steer classes, older steers of a given feeder grade tended to yield higher grading carcasses than younger steers when total gains were equal.

Records for 270 heifer calves showed that within a feeder grade initial weight and rate of gain had little influence on carcass grade when total gains were equal. Good and Choice feeder heifers produced slightly higher grading carcasses than similar steers at equal final weights.

Of 8 carcass characteristics studied, marbling of the lean and thickness of the external covering had the highest correlation with rate of gain. Width and depth of body, thickness of finish, and shape of head of feeders were all highly correlated with feeder grade. Feeder grade, total gain, thickness of external fat, and thickness of flesh of carcass were all highly significant in determining carcass grade.

The growth of micro-organisms on ox muscle.—III, The influence of 10 per cent carbon dioxide on rates of growth at —1° C., W. J. Scott (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *11* (*1938*), *No. 3, pp. 266–277, figs. 7*).—Continuing this series of investigation (E. S. R., 79, p. 231), the introduction of 10 percent carbon dioxide into the storage atmosphere of thin slices of beef muscle inoculated with various organisms and held at —1° reduced the growth rate of *Achromobacter* to from 0.4 to 0.5 of the rate in air, *Pseudomonas* to 0.25, and three species of yeast to 0.46, 0.55, and 0.86, respectively, of the growth rates in air. The efficiency of 10 percent carbon dioxide as a growth inhibitor increased with decreasing moisture contents of the muscle. The application of these findings to the transport of chilled beef is discussed.

Sheep production in Georgia, Z. A. Massey (*Georgia Sta. Bul. 200* (*1938*), *pp. 18, figs. 15*).—This bulletin is primarily a popular discussion of desirable sheep selection, feeding, and management practices. The results of two feeding experiments are briefly summarized. In a trial comparing *Sericea lespedeza* hay v. cowpea hay for fattening lambs the *Sericea* hay was readily consumed, but pound for pound was worth only 81 percent as much as the cowpea hay. In a trial comparing sweetpotatoes v. ground white corn as the principal ingredient in the concentrate ration for fattening lambs, the two rations produced practically identical gains while the former was more efficient per unit of digestible nutrients consumed. A comparison of temporary v. permanent pastures for ewes and their lambs showed that lambs dropped on temporary pastures of rye, oats, wheat, or rape made more rapid and better gains and remained freer from internal parasites than lambs dropped on the permanent sod.

Ground alfalfa vs. tankage for sows, V. A. Freeman (*Michigan Sta. Quart. Bul., 21 (1938), No. 2, pp. 91–93*).—The results of four trials comparing ground alfalfa and tankage as supplements to corn for brood sows during the gestation period are summarized. Ground alfalfa was mixed with the grain in the proportion of 1:2 for one group, while the other group received approximately 6 percent of tankage in the ration. The sows receiving the tankage ration made slightly greater average daily gain, but on the basis of number of pigs per litter, weight per litter, and percentages of strong, medium, weak, and stillborn pigs there was no material difference in the results secured from the two rations. There was little difference in the apparent milking abilities of the two lots of sows when each received tankage as a protein supplement during the nursing period.

The digestibility and biological utilization of potato protein by swine [trans. title], E. Mangold and A. Columbus (*Landw. Vers. Sta., 129 (1937), No. 1–2, pp. 12–27*).—Studies of two new potato protein preparations are reported. One, designated as potato protein-pulp flakes, was prepared by drying the coagulated potato juice proteins with the pulp, and the other was pure potato protein resulting from heat coagulation and drying of the potato juice proteins. These contained 26.9 and 75.1 percent of crude protein on a dry matter basis, and this in trials with pigs was 66.5 and 73.9 percent digestible, respectively. The biological values of these proteins were 86 and 83 when fed to pigs at a maintenance level, and 88.5 and 79, respectively, when fed at a level adequate for maintenance plus growth.

The composition and digestibility of a new potato feeding stuff (dried potato juice-pulp flakes) [trans. title], K. Nehring and W. Schramm (*Landw. Vers. Sta., 129 (1937), No. 1–2, pp. 28–33*).—In another study with the product described above it was found to contain protein 23.8 percent, crude fiber 5.86, fat 0.54, nitrogen-free extract 56.14, and ash 13.66 percent. Coefficients of digestibility as determined with pigs were organic matter 78.5, crude protein 62.3, and nitrogen-free extract 87.8.

The vitamin requirements of pigs, with special reference to vitamin A and to certain components of the vitamin B complex, A. S. Foot, J. Golding, S. K. Kon, J. Campion, K. M. Henry, and S. L. Huthnance (*Reading, Eng.: Natl. Inst. Res. Dairying, 1938, pp. 68, [pls. 10], figs. [10]*).—An extensive review of the literature and the results of original research are presented, with special reference to the requirements of the pig for vitamin A and certain components of the vitamin B complex.

[Poultry Science Association, thirtieth annual meeting] (*Poultry Sci., 17 (1938), No. 5, pp. 431–447*).—Abstracts of 51 papers presented before the meeting held at Washington State College, August 15–18, 1938, are noted (E. S. R., 78, p. 523).

Factors affecting the hatching weight of Brown Leghorn chickens, N. Galpin (*Roy. Soc. Edinb. Proc., 58 (1937–38), No. 2, pp. 98–113, figs. 7*).—Seasonal variations in the embryonic growth rate of chickens were observed in this study at the Institute of Animal Genetics, Edinburgh. Hatching weight and egg weight were inversely related to the level of egg production. The coefficient of correlation between egg weight and hatching weight was highest in the early spring, decreased until July, and then increased in autumn. Thyroid weight decreased from the time of onset of laying until July and then increased, rapidly reaching a maximum weight during the fall molting period. Regression coefficients indicated that the change in dependence of hatching weight on egg weight is due to varying ability of the embryo to utilize the egg substance provided, which is interpreted as an expression of varying maternal metabolism.

Comparative growth and feed consumption of roasters, capons, and pullets, G. E. Annin and J. G. Halpin. (Wis. Expt. Sta.). (*Poultry Sci., 17 (1938), No. 5, pp. 419–422*).—Two years' trials with purebred and cross-bred cockerels and capons indicated that there was no significant difference in the rate of growth or feed consumption between the cockerels and capons or between the purebreds and cross-breds. The feed required per unit of gain constantly increased with advancing age, particularly after 24 weeks of age, indicating the desirability of marketing capons as soon as they would command the usual premium over heavy roasters. It proved profitable to hold late-hatched pullets for winter egg production and then sell them for meat in the spring when poultry meat prices are generally highest.

The utilization of wheat and wheat by-products in feeding young chickens, I–V, W. E. Poley. (Ind. Expt. Sta.). (*Poultry Sci., 17 (1938), Nos. 4, pp. 331–344, figs. 4; 5, pp. 390–404, figs. 3*).—Five articles are presented.

I. *The effect of the fineness of grinding wheat.*—With ground wheat comprising 75 percent of the chick ration, there was no appreciable difference in the growth rate or feed consumption per unit of gain to 8 weeks of age when medium or coarsely ground wheat was fed. When very finely ground wheat was fed, 75 percent of the chicks developed crooked beaks (pressure necrosis) within 3 weeks' time due to the sticky feed adhering to the mouth parts so that this group had to be discontinued.

II. *Alfalfa leaf meal as a vitamin A supplement for ground wheat.*—By varying the alfalfa leaf meal content from 1 to 7 percent in a basal ration of ground wheat, meat-and-bone scrap, dried skim milk, and salt, it was found that at least 3 percent of the alfalfa leaf meal was necessary to provide sufficient vitamin A for normal growth in chicks. Definite vitamin A deficiency symptoms occurred when only 1 percent was added.

III. *Ground wheat, bran, and middlings as sources of the antineuritic vitamin B.*—Young chicks were fed various levels of ground wheat, wheat bran, or wheat middlings in combination with a vitamin B_1-deficient basal diet. Twenty percent of ground wheat was insufficient to prevent polyneuritis and death, while 30 percent of ground wheat supplied sufficient vitamin B_1 for normal growth and health to 10 weeks of age. Ten percent of bran in the diet resulted in polyneuritis in 3 weeks, while 20 percent of bran supported normal development. Either 10- or 20-percent levels of middlings prevented polyneuritis, but growth was relatively slow at the lower level. A ration of ground wheat and degerminated yellow corn 45:55 resulted in polyneuritis in mature males.

IV. *Ground wheat as a source of vitamin G growth factor. Unknown factors which affect plumage color and structure.*—Wheat proved to be somewhat more potent than corn in vitamin G. A ration containing 3 percent alfalfa meal and 50 percent ground wheat provided sufficient vitamin G for practically normal growth, while reducing the wheat content to 30 percent and substituting corn for the remaining 20 percent resulted in a vitamin G deficiency. Certain abnormalities in plumage structure and color are described. Including a high percentage of ground wheat or smaller amounts of bran, middlings, or dried skim milk in the diet improved the plumage structure but did not supply the factors necessary for normal pigmentation in the feathers of Barred Rock chicks.

V. *Protein supplements for ground wheat.*—Six trials are reported showing the effect of various levels and sources of protein when wheat was the principal ingredient in the chick diet. Replacing a part of the wheat with either bran or middlings failed to improve the growth-promoting value of the ration. Meat-and-bone scrap in combination with dried skim milk or soybean oil meal proved an effective source of protein.

The influence of distillery slop on the production of chicken fat, G. D. Buckner, W. M. Insko, Jr., J. H. Martin, and A. Harms. (Ky. Expt. Sta.). (*Poultry Sci., 17 (1938), No. 5, pp. 369–371*).—The effects of replacing a part or all of the corn with thick distillery slop in an all-mash ration for chicks on the amount, flavor, and physical properties of chick fat were studied. The rations containing the larger amounts of corn developed fatter, better flavored chicks, while the rations containing little or no corn resulted in a decidedly inferior product. The iodine number of the body fat was 71.5 for the group receiving no distillery slop and ranged from 83.2 to 91.2 for those receiving the slop at various levels. The uropygeal gland oil, which had a much lower iodine number than body fat, was much less affected by the type of ration. The refractive indexes of the fat did not vary materially in the four lots.

A preliminary investigation of the value of corn distillers' dried grains in chick rations, R. T. Allman and H. D. Branion (*Sci. Agr., 18 (1938), No. 12, pp. 700–707*).—In an experiment with young chicks in battery brooders, involving 10 experimental rations, the addition of wheat germ, dried brewers' yeast, or corn distillers' grains, either singly or in combination, to an ordinary type of ration markedly improved the rate and economy of gain and feather development. Since the protein level of the ration was only slightly affected by adding such supplements, the beneficial effects were attributed to the additional amounts of the vitamin B complex supplied.

A nutritional disease of chicks caused by feeding dried eggs, W. C. Tully. (Iowa Expt. Sta.). (*Poultry Sci., 17 (1938), No. 5, pp. 355–368, figs. 5*).—In an attempt to determine whether a pellagra-like syndrome occurring in chicks under certain conditions of egg feeding was due to a deficiency or toxicity and whether the egg yolk or white was involved and to study symptoms of the disease and methods of prevention, 22 lots of chicks were fed various experimental diets in which commercially dried egg and egg white were fed in several combinations. The use of 15 percent of dried egg in combination with 10 percent of dried buttermilk and 5 percent of meat scrap in the diet resulted in excellent growth and only a very slight incidence of the pellagra syndrome. Dried egg as the sole source of animal protein in the diet gave significantly better growth than when an equivalent amount of protein as dried buttermilk was fed. Commercially dried egg samples varied considerably in their growth-promoting qualities. Dried egg white at an 8.6-percent level, when supplemented with yeast and/or milk in an otherwise complete diet, resulted in poor growth and the incidence of a severe pellagra syndrome. A similar condition prevailed when commercially dried egg albumin or raw egg white was incorporated in an otherwise complete diet. Heating the dried white did not improve its nutritive value, but coagulating the egg white markedly improved its nutritional properties. No definite relationship between the level of blood proteins and the incidence of a pellagra syndrome could be established. Chicks stunted in growth and suffering severely from this syndrome made rapid and complete recovery when fed a complete ration.

The effects of rations containing gradient amounts of cod liver oil on the subsequent performance of laying pullets following a natural infection of coccidiosis, R. R. Murphy, J. E. Hunter, and H. C. Knandel. (Pa.

Expt. Sta.). (*Poultry Sci., 17 (1938), No. 5, pp. 377–380, figs. 3*).—The trends in body weight, egg production, and mortality are graphically presented for eight groups of White Leghorn pullets receiving graded amounts of cod-liver oil (range 0.0625 to 1 percent) following a severe outbreak of coccidiosis at 26 weeks of age. Those groups receiving 0.375 percent or more of cod-liver oil made a much more rapid recovery in body weight following the outbreak and showed a higher average percentage of egg production and a lower percentage mortality throughout the ensuing laying year, indicating that subsequent performance following such an infection is at least partially dependent on the adequacy of the ration.

The influence of dried buttermilk in rations on fatality with coccidiosis in chicks, E. R. Becker and H. L. Wilcke. (Iowa Expt. Sta.). (*Poultry Sci., 17 (1938), No. 5, pp. 405–407*).—The rates of mortality in four artificially inoculated lots of chicks receiving rations containing 0, 10, 40, and 40 percent of dried buttermilk, respectively, were approximately 30, 72, 60, and 24 percent, respectively. The "ordinary type" rations Nos. 2 and 3, containing dried buttermilk, resulted in high mortality but supported better growth than the No. 1 ration. The relatively low mortality on the No. 4 ration containing 40 percent of dried buttermilk but otherwise containing only corn, oats, and bran indicated that the high mortality on rations Nos. 2 and 3 could not be attributed solely to the presence of the dried buttermilk in the ration.

Time interval between clutches in Rhode Island Red pullets, F. A. Hays. (Mass. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 8, pp. 575–581, figs. 3*).—Supplementing a previous report (E. S. R., 75, p. 533) on the same group of birds, data are presented on the time interval between clutches from first egg to March 1 for 409 pullets and for the entire first laying year for 119 birds. The monthly interval between clutches was at the lowest level in December and at the highest level in June. Birds with winter pause showed a longer interval between clutches than nonpause birds when both were laying. The small clutch size in winter was associated with long time interval between clutches. Short interval between clutches was associated with long intervals between eggs, and vice versa. Short intervals between clutches were associated with high winter production, but time interval between clutches in winter was not related to persistency at the end of the year. Short intervals between clutches were characteristic of high producers. There was no significant association between length of interval between clutches and hatching season egg weight but some evidence that short intervals were associated with high hatchability.

The relationship between egg shell thickness and strength, W. A. Lund, V. Heiman, and L. A. Wilhelm. (Wash. Expt. Sta.). (*Poultry Sci., 17 (1938), No. 5, pp. 372–376, figs. 3*).—An apparatus for measuring the resistance of eggshells to a crushing and puncturing force is described. The average force required to crush the eggs used in this study was 4.73 and 5.57 kg for the large and small ends, respectively. The coefficient of correlation between shell thickness and the crushing resistance of the eggs was 0.633±0.021 and between shell thickness and resistance to puncturing 0.835±0.011.

Criteria of conformation in market poultry, R. G. Jaap and R. Penquite. (Okla. Expt. Sta.). (*Poultry Sci., 17 (1938), No. 5, pp. 425–430*).—Continuing this line of investigation (E. S. R., 79, p. 527), data are presented on the weight, shank length, length of keel, minimum anterior depth, and breast width for groups of dressed cockerels, capons, and male and female turkeys, classified by the tentative U. S. market grades for dressed poultry (1935). The different conformation groups (visually classified) showed significant differences in the relation between the cube root of body weight and the above measurements. Correlations obtained between the same measurements on live and dressed birds indicated that shank length, keel length, and minimum anterior depth could be accurately determined on live birds. Differences in the conformation of live birds could be accurately expressed by comparing body weight and these three measurements.

Feeding and confinement rearing experiment with turkeys during 1937 (third report), F. N. BARRETT, C. G. CARD, and A. BERRIDGE (*Michigan Sta. Quart. Bul. 21 (1938), No. 2, pp. 79–87, fig. 1*).—The third year's results in this series of trials (E. S. R., 78, p. 92) essentially confirmed previous findings. A 27-percent protein mash ration containing ground corn and ground oats as the principal grains, and meat scrap, soybean oil meal, and dried skim milk as the principal sources of protein, with corn as a scratch grain, continued to produce thrifty turkeys with smooth, lustrous plumage and of excellent market quality and is recommended as an excellent all-purpose mash. Substituting barley for corn in both the mash and grain rations gave practically as good results and may be safely recommended. A 25-percent protein mash in which corn gluten meal replaced the dried skim milk failed to give satisfactory development and is not recommended. There was little, if any, economy or advantage in substituting an 18-percent protein mash for the 27-percent protein mash after turkeys were from 8 to 12 weeks of age. Turkeys on the lower protein mashes consumed more mash and less grain than those on the higher protein mashes. All turkeys consumed a greater proportion of grain and a lower proportion of mash as they approached maturity.

A cobblestone turkey yard satisfactorily employed during the 1937 season is described.

Manure production of adult turkeys, S. J. MARSDEN. (U. S. D. A.). (*Poultry Sci., 17 (1938), No. 5, pp. 423, 424*).—In a test extending from October 9 to November 6 a pen of medium-sized turkeys, including 20 hens and 2 toms, produced an average of 2.4 lb. of fresh manure per bird per week (equivalent to 0.6 lb. on a machine-dried basis). At this season 72.7 percent of the manure was deposited during the daytime and 27.3 at night.

DAIRY FARMING—DAIRYING

Dairy cattle feeding and management, H. O. HENDERSON, 1. ed. by C. W. LARSON and F. S. PUTNEY (*New York: John Wiley & Sons; London: Chapman & Hall, 1938, 3. ed., pp. XXVI+557, figs.* [*109*]).—The third edition of this popular text, while retaining the general plan of the former edition (E. S. R., 59, p. 666), has been entirely rewritten and enlarged. Two entirely new chapters have been included and others have been expanded and brought up to date.

A manger for experimental feeding, A. D. PRATT. (Va. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 10, pp. 643, 644, figs. 2*).—An inexpensive type of manger which has proved very effective in preventing loss of hay during experimental feeding of cows is described and illustrated.

The Hohenheim system in the management of permanent pastures for dairy cattle, T. E. WOODWARD, J. B. SHEPHERD, and M. A. HEIN (*U. S. Dept. Agr., Tech. Bul. 660 (1938), pp. 34, figs. 5*).—A summary of 6 years' results obtained at Beltsville, Md., from grazing milking dairy cows and dairy heifers under three systems of pasture management are presented. One pasture was divided into six equal-sized lots, given a heavy application of complete fertilizer, and rotationally grazed according to the Hohenheim system; the second pasture received a heavy application of fertilizer and was continuously grazed; and the third was unfertilized and grazed continuously. Rotation grazing increased the returns by 10.4 percent over the continuously grazed fertilized area. Under continuous grazing the fertilized pasture yielded 16.4 percent more than the unfertilized one, while the combination of rotation grazing and fertilization increased the yield 28.6 percent. On the basis of feed replacement value obtained the heavy application of fertilizer was not profitable. This was partially attributed to the fact that practically all legumes disappeared from the fertilized areas, whereas common lespedeza was obtained in the unfertilized pasture and materially increased the late summer grazing yields. Heavy fertilization did not increase the uniformity of carrying capacity throughout the grazing season. The division of pastures into lots for rotational grazing might prove economical, depending upon the cost of providing fences, water, and shade.

Feed units for lactation, working maintenance, and gain in live weight in Danish dairy cows, W. L. Gaines. (Ill. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 10, pp. 645–650, fig. 1*).—An analysis of 666 records of Red Danish cows on farms in Denmark led to the formulation of the following equation for expressing the nutritive requirement of milking cows of this breed: $DN=0.35FCM+0.006W$, in which DN is the pounds of digestible nutrients per day, FCM the milk energy yield in pounds of 4-percent milk per day, and W the live weight in pounds. This formula differs from that recently developed for Holstein, Guernsey, and Jersey cows (E. S. R., 80, p. 386) in that the Red Danish require somewhat more feed energy for lactation per unit of milk energy produced but less feed energy for working maintenance per unit of live weight. In each case working maintenance was proportional to live weight and not to a fractional power of live weight.

Relative values for milk production of hay and silage made from immature pasture herbage, R. R. Graves, J. R. Dawson, and D. V. Kopland (*U. S. Dept. Agr., Tech. Bul. 649 (1938), pp. 32, figs. 2*).—In experiments at the Huntley (Mont.) Field Station, two groups of Holstein cows which had previously completed lactation records on full-feed grain and roughage rations were fed immature grass hay (field cured) and immature grass silage (without preservative), respectively, as sole rations for 365-day lactation periods. The grass (mixed grasses and clover) was grown under irrigation and cut four times each season. The hay and silage contained 14.8 and 15.7 percent crude protein, respectively (dry matter basis). The silage averaged 33.3 percent dry matter, was of good color and odor, and proved palatable.

The four cows receiving hay completed six lactations in which their milk and butterfat production was about 64 percent of that obtained under full-feed conditions. They consumed an average of 43.5 lb. of hay per cow daily, which supplied about 19 percent more total digestible nutrients than was required as compared with 7 percent more nutrients consumed than required when on full feed. The four cows receiving silage produced about 61 percent as much as when on full feed. They consumed an average of about 91 lb. per head daily, which supplied 3 percent more nutrients than required as compared with a consumption of 9 percent more nutrients than required when on full feed. Both lots appeared to be in normal health at all times. They maintained a good appetite but showed a desire for other types of feed.

Physiological effect of a limited ration on dairy cows, O. C. Cunningham and L. H. Addington (*New Mexico Sta. Bul. 257 (1938), pp. 24, figs. 6*).—In the experiments reported, 21 dairy cows, all of which had previously completed one or more lactation records on normal rations, were fed a ration of ground hegari fodder and cottonseed meal for one or more complete lactation periods. All but one of these completed one or more gestation periods on this ration. The time the various cows were continuously fed this experimental ration ranged from 429 to 1,386 days. All cows receiving this ration without the mineral supplement produced 79.6 percent of the expected butterfat production during the first lactation on experiment and 70.4 percent during the second lactation. Cows receiving 2 percent of calcium carbonate as a supplement to this ration produced 57.9 percent of the expected butterfat level during the first and 68.4 percent during the second lactation on the experiment. Of 26 calves born after the cows were on the unsupplemented ration, 9 were normal, 4 aborted fetuses, 10 were weak at birth, and 3 showed muscular incoordination, blindness, or both, at birth. Of 12 calves from cows on the calcium-supplemented ration, 5 were normal, 4 weak or died shortly after birth, and 3 were blind. The blindness found in these calves was caused by a constriction of the optic nerve produced by a stenosis of the optical canal where it passed through the optical foramen. Many of the cows exhibited symptoms of night blindness from time to time during the experiment. A number of the cows, particularly those that produced aborted fetuses and blind or weak calves, also developed a specific type of edema affecting the hocks and rear portions of the animal. A number of the cows developed anorexia. This condition was corrected in most instances by the administration of vitamin A in the form of Haliver oil for a short period. These findings led to the conclusion that the experimental ration did not contain enough carotene or vitamin A to meet the requirements of dairy cattle for normal reproduction and well-being when fed for a comparatively long period.

[Dairy cattle feeding tests in Georgia] (*Georgia Sta. Rpt. 1938, pp. 51, 52, 53, fig. 1*).—Results are briefly noted on the comparative value of beet pulp and citrus pulp in the ration of milking cows, the effects of supplementary concentrate feeding on the growth and development of dairy heifers on summer pasture, and the value of winter grains for grazing dairy calves.

The breeding efficiency of proved (aged) sires, J. R. DAWSON. (U. S. D. A.). (*Jour. Dairy Sci., 21 (1938), No. 11, pp. 725–737, fig. 1*).—An analysis of the breeding records of 20 proved dairy sires after they were 5 yr. of age showed an average breeding efficiency for the group of 40 percent. Breeding efficiency tended to decline with advancing age, averaging 51.9 percent at 5–7 yr. of age, 44.4 at 7–9 yr., 35.1 at 9–11 yr., 37.7 at 11–13 yr., and 28.3 percent when over 13 yr. Breeding efficiency was materially lowered when the bulls were used for seven or more services per month as compared with those in lighter service. The data on the effect of season or moving the bulls to new locations were variable and inconclusive. It appeared that, because of the extreme and inconsistent variation in fertility exhibited in all phases of this study, averages are of little value for application to individual sires.

Relation between rate of growth and milk and fat production, H. P. DAVIS and E. L. WILLETT. (Nebr. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 10, pp. 637–642*).—An analysis of the growth records, including live weight, height at withers, and chest girth, of 76 Holstein cows from birth to 2 yr. of age and their lifetime milk and butterfat production records failed to establish any correlation between the rapidity of growth of these animals and their milk- and butterfat-producing ability either during their first lactation or for their lifetime average of lactations.

Fasting energy metabolism during lactation, L. E. WASHBURN. (Mo. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 11, pp. 697–704, fig. 1*).—The fasting heat production of a mature lactating cow and a mature dry cow was measured by an open-circuit-mask respiration method at frequent intervals during a fasting period of 72 hr. The total heat production per unit of physiologic weight ($W^{0.73}$) was about 10 percent higher for the lactating cow than for the dry cow. Up to 60 hr. of fast the heat production curves of the two animals were essentially parallel, reaching a level at from 36 to 48 hr Beyond 60 hr. the curve of the dry cow continued on a level, while that of the lactating cow further declined about 20 percent. During the fasting period the lactating cow continued to yield a relatively constant amount of milk fat, although total milk yield declined about 50 percent, and it seemed probable that during such fast lactation as a mechanism was unchanged. The fecal output during this period was considerably greater for the milking animal. This fact, coupled with the probability of considerable absorption occurring 72 hr. after feeding, suggests that the fasting level of total heat production is not an accurate measure of physiologic maintenance in ruminants and that such values for dry and lactating cows are not comparable without further correction.

The efficiency of the mammary gland in the production of milk, W. R. Graham, Jr., O. B. Houchin, V. E. Peterson, and C. W. Turner. (Mo. Expt. Sta.). (*Amer. Jour. Physiol., 122 (1938), No. 1, pp. 150–153*).—The results of the experiments reported, based on the respiratory quotient of the actively secreting mammary gland of goats and the ratio of blood flow through the gland to volume of milk secreted, indicated that the gross efficiency of the mammary gland is slightly more than 90 percent, and that consequently the cost of transformation of the blood precursors to milk substance is somewhat less than 10 percent of the total energy transfer.

Bound water and its relation to some dairy products.—III, The relation of bound water to some dairy phenomena, H. Pyenson and C. D. Dahle. (Pa. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 10, pp. 601–614*).—Continuing this series of studies (E. S. R., 80, p. 246), the bound water content of the milk colloids was found to have little effect on the creaming ability of the milk. The increase in the specific gravity of fresh milk and skim milk on aging is partially attributed to the increase in the bound water content of the proteins and their hydrophilic substances in milk. Aging concentrated milk plasma caused an increase in bound water content, while dried skim milk lost some of its bound water with age. Superheating condensed skim milk had no appreciable effect on bound water content, while pasteurization reduced both viscosity and bound water in milk and cream. Rapid heating and cooling of cream which increased its viscosity also increased its bound water content. Single-stage homogenization of ice cream mixes increased viscosity but decreased the bound water content, while dual homogenization of the same product increased both factors. Moderate changes in bound water content of dairy products generally had little effect on protein stability. However, heating milk to a high temperature decreased bound water, while increasing stability of protein and superheating condensed skim milk increased protein stability without significantly affecting the bound water content.

The vitamin A content of the colostrum of dairy cows, J. Stewart and J. W. McCallum (*Jour. Agr. Sci. [England], 28 (1938), No. 3, pp. 428–436, figs. 2*).—The vitamin A content of the colostrum of 100 cows, collected within a few hours after calving, ranged from 35 to 1,181 International Units per 100 cc. There was a pronounced decline in vitamin A value of samples collected from the first to the seventh day after calving. All animals were similarly fed and managed, and there was no evidence that this wide range in vitamin A value was due to differences in feed, breed, or date of calving. The results suggested that it may be related to the length of the dry period between successive calvings.

Riboflavin content of milk collected in different months and correlated with other constituents of the milk, C. H. Whitnah, B. L. Kunerth, and M. M. Kramer. (Kans. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 10, pp. 593–600, fig. 1*).—Milk samples collected at intervals from individual normal cows of different breeds and on different rations were analyzed for riboflavin content. During March, April, and May samples from Ayrshire cows contained an average of 1.17 p. p. m., Holsteins 1.37, Guernseys 1.53, and Jerseys 1.73 p. p. m. of flavin. Stage of lactation had little effect as evidenced by the fact that milk from cows between 15 days and 10 mo. after freshening showed very little difference in flavin content. Samples collected in July after the cows had been pastured for several weeks averaged slightly higher in flavin than spring samples. However, the large variations in correlation indicated that climate and rations were not the only important factors causing such variations. The relationship of flavin content to the amounts of vitamin C, losses of vitamin C on storage, carotene, lecithin, fat, protein, phosphatase, leucocytes, mastitis streptococci, odd bacteria, lactose, and chlorine in milk was determined. Of these, only fat showed a significant and consistent relationship to flavin.

Assays of riboflavin and the filtrate factor in certain milk products, T. H. Jukes and G. A. Richardson. (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 8, pp. 603–610*).—Two series of spray-dried milk products, one from November milk and the other from May milk, were assayed for the filtrate (chick dermatitis) factor and riboflavin content. The products included whole milk, skim milk, buttermilk, rennet whey, hydrochloric acid casein whey, sulfuric acid casein whey, and lactic acid casein whey. When assayed with chicks on a basal diet of heated natural feeding stuffs the various types of dried whey furnished 3 to 6 units of the filtrate factor per gram, dried buttermilk 3 to 4, dried skim milk 2 to 3, and dried whole milk 1 to 2 units. Chick assays for riboflavin indicated that these milk products supplied from 2 to 5 times as much riboflavin as filtrate factor in terms of similarly computed chick units (1 chick unit equivalent to about 2.3 μg of synthetic *d*-riboflavin). Buttermilk was definitely richer in riboflavin than skim milk. Any possible differences in potency of either factor in the November and May samples were too small to be detected by the assay methods employed.

Anomalies in the bio-assay of vitamin D milk, K. Morgareidge and B. O'Brien (*Jour. Nutr., 16 (1938), No. 4, pp. 395–405*).—In experiments at the University of Rochester, two vitamin D concentrates (Vitex and UVO) available to the dairy industry for the production of vitamin D milks were assayed for vitamin D potency. Both materials were assayed in three different ways: (1) The desired level of concentrate per animal was mixed with about 100 mg of skim milk and administered with pipette, (2) the same as (1) but in addition 4 cc of skim milk was included in the daily diet, and (3) the concentrate was fed as a fortified skim milk, 4 cc containing the desired dosage. The apparent potency revealed by these assays in comparison with the expected potency based on the International Units of vitamin D ingested indicated an average response of 111 percent normal for the first method, 185 percent for the second, and 293 for the third. Thus it appeared that not only did the presence of milk in the diet enhance the action of vitamin D, but that the degree of enhancement was markedly dependent on the physical relation between the two factors in the gastrointestinal tract. The probable role of the phosphorus and lactose supplied in milk is discussed.

Feed flavors in milk and milk products, C. J. Babcock. (U. S. D. A.). (*Jour. Dairy Sci., 21 (1938), No. 10, pp. 661–668*).—A review, citing 34 references to the literature.

The microscope in the production of high quality milk, C. S. Bryan, G. J. Turney, W. K. Fox, L. H. Begeman, X. A. Miles, and J. S. Bryan. (Mich. Expt. Sta.). (*Jour. Milk Technol., 1 (1938), No. 5, pp. 26–34, fig. 1; abs. in Michigan Sta. Quart Bul., 21 (1938), No. 2, p. 139*).—Based on tests of monthly samples of milk from a large number of producers in the Lansing, Mich., milk shed, the relationship between direct microscopic bacterial counts and the methylene blue reduction test, sediment test, and temperature of the milk on arrival at the receiving station were determined. Most samples having a count of less than 100,000 bacteria per cubic centimeter were of class 1 for methylene blue and classes 1, 2, or 3 for sediment test and under 60° F. when received. Those samples ranging from 100,000 to 500,000 bacteria per cubic centimeter were in class 2 or occasionally class 3 for methylene blue and in classes 2 and 3 for the sediment test. Such milks were frequently above 65° when received. Dirty utensils, poor cooling, and dirty cows and barns were major sources of contamination in this group. Milks ranging from 500,000 to 1,000,000 bacteria per cubic centimeter fell in classes 2, 3, and 4 for methylene blue rating and were high in visible dirt on the sediment test. The temperatures of such milks were high and few rated a passing score. The types of bacteria present indicated a need for a thorough clean-up of all phases of milk production. Milks containing above 1,000,000 bacteria per cubic centimeter were mainly in classes 3 and 4 for methylene blue and 2, 3, and 4 for sediment test, and were generally above 65°, and none rated a passing score.

Detecting the neutralization of milk with the cryoscope, B. Heinemann (*Jour. Dairy Sci., 21 (1938), No. 10, pp. 621–631, figs. 2*).—The freezing points of normal milks of varying degrees of acidity and of neutralized milks, using various neutralizing agents, have been compared. A direct relationship was observed between developed acidity and freezing point, which varied only slightly from one sample to another. The use of sodium hydroxide and magnesium carbonate as neutralizers in necessary quantities did not appreciably affect the freezing point, whereas sodium carbonate and sodium bicarbonate used in necessary quantities materially lowered the freezing point. In some instances neutralization of as little as 0.015 percent could be detected by the freezing point test, depending on the normal acidity of the sample and the kind of neutralizer used. In other cases samples with low natural acidity could be soured and then neutralized as much as 0.075 percent with sodium hydroxide without being detected by this test. Heating the neutralized sample tended to raise the freezing point slightly. After neutralization, further souring did not interfere with the accuracy of the test. The application and limitation of this test and the possibility of extending its use to cream samples are discussed.

Improvements in the rapid phosphatase test for detection of improper pasteurization of milk and its products, H. Scharer (*Jour. Milk Technol., 1 (1938), No. 5, pp. 35–37*).—The improvements made in the rapid phosphomonoesterase test for control of pasteurization (E. S. R., 79, p. 99) are described. These modifications are conducive to greater sensitivity and extend the application of this test to butter, cheese, and ice cream.

[Abstracts of papers presented at the fortieth general meeting of the Society of American Bacteriologists] (*Jour. Bact., 36 (1938), No. 3, pp. 309–312*).—Abstracts of the following papers, dealing with subjects of significance in dairying, are noted: Factors Influencing the Bacterial Content of Aseptically Drawn Milk, by K. R. Stevens and L. W. Jones (Utah Expt. Sta.); *Lactobacillus thermophilus* in a City Milk Supply, by D. B. Charlton and G. F. Steel

(Oreg. State Col.); A Differential Stain for the Direct Examination of Milk, by J. Broadhurst and C. Paley; and The Rôle of Agglutinins in the Hotis Test and The Effect of Soaps on *Streptococcus agalactiae*, both by E. C. McCulloch (Wash. State Col.).

Second conference on sanitation of paper milk containers, reported by R. S. Breed (*Jour. Milk Technol., 1 (1938), No. 5, pp. 47–53, fig. 1*).—The principal topics of discussion at this conference, a supplementary note on sanitary inspection and control at pulp and paper mills, and a revised list of the principles of sanitation to be observed in the manufacture and use of paper containers for milk are included in this report (E. S. R., 78, p. 392).

Operation of the cream-buying station, H. A. Ruehe (*Illinois Sta. Circ. 487 (1938), pp. 26+[1], figs. 6*).—Included are discussions of the cream-buying station operator and his equipment, methods for making the cream test, causes of defective tests, care of test bottles, the problem of station shortage, care of cream cans, and methods by which patrons can improve cream quality.

Twenty-fourth annual report of the creamery license division, T. H. Binney (*Indiana Sta. Circ. 238 (1938), pp. 16*).—This is the usual report (E. S. R., 78, p. 845) of the number of creamery licenses issued and testers examined and licensed during the year ended March 31, 1938. The licensed dairy manufacturing plants in the State on October 1, 1938, are listed.

Volume changes of fat in cooled cream held at constant temperature, A. H. Rishoi and P. F. Sharp. (Cornell Univ.). (*Jour. Dairy Sci., 21 (1938), No. 11, pp. 683–687, figs. 2*).—Using the dilatometer to follow the changes in physical state of the fat held at constant temperature, it was found that at 0°, 5°, and 10° C. the maximum concentration of the fat in cooled cream occurred in about 4 hr., while at 15° and 20° the contraction of the fat was more gradual, in some instances continuing over a period of months. At 0° and 5°, after the maximum contraction of the fat was reached a gradual expansion occurred for 2 mo. or more, probably due to a phase adjustment following the initial rapid crystallization of the fat. This rapid adjustment of the physical state of the fat globules at low temperature greatly influenced such properties as viscosity, creaming, surface tension, foaming, and lipase activity.

The relation between acid defects and hydrogen ion concentration in brick cheese, W. V. Price and D. W. Spicer. (Univ. Wis.). (*Jour. Dairy Sci., 21 (1938), No. 10, pp. 615–620, figs. 2*).—The pH values were determined for 48 lots of brick cheese on the third and seventh days after manufacture, and these data were correlated with the acid grade of the cured cheese. Cheeses grading sweet, trace of acid, acid, very acid, and sour had average acidities on the third day of pH 5.09, 5.03, 4.95, 4.99, and 4.92, respectively, indicated that such pH values are a useful index of the acid characteristics of the ripened cheese. The minimum pH should not be less than 5.1 at this time, which approximates that desired in American cheese. It is suggested that characteristic acidity limits probably distinguish other varieties of cheese.

Dairy waste elimination and sewage disposal, H. A. Trebler, R. P. Ernsberger, and C. T. Roland (*Sewage Works Jour., 10 (1938), No. 5, pp. 868–889, figs. 5*).—This discussion deals with the classification of dairy wastes and various methods for the most economical disposal of each. The results of experimental work with a tin can trickling filter are described. This has proved to be a cheap and satisfactory type of set-up in comparison with more elaborate conventional types of sewage treatment equipment. A discussion by C. L. Siebert is also included.

VETERINARY MEDICINE

Special pathology and therapeutics of the diseases of domestic animals, I–III, F. Hutyra, J. Marek, and R. Manninger, edited by J. Russell Greig with the collab. of J. R. Mohler and A. Eichhorn (*London: Baillière, Tindall & Cox, 1938, 4. Eng. ed.,* [*rev.*], *vols. 1, pp. XVI+962, pls. 16, figs.* [*318*]; *2, pp. XI+704, figs. 186; 3, pp. XI+763, pls. 7, figs. 221*).—A new English edition of the work previously noted (E. S. R., 55, p. 573), in which the part on infectious diseases was prepared by R. Manninger.

Veterinary pathology and bacteriology, S. H. Gaiger and G. O. Davies, 2. ed. by G. O. Davies (*London: Baillière, Tindall & Cox, 1938, 2. ed.,* [*rev.*], *pp. X+712, figs. 198*).—A revised and enlarged edition of the work previously noted (E. S. R., 68, p. 666).

Manual of veterinary bacteriology, R. A. Kelser (*Baltimore: Williams & Wilkins Co., 1938, 3. ed.,* [*rev.*], *pp. XIII+640, figs. 93*).—A revised and enlarged edition of the work previously noted (E. S. R., 69, p. 709).

Atlas of hematology, E. E. Osgood and C. M. Ashworth (*San Francisco: J. W. Stacey,* [*1937*], *pp. XIII+255,* [*pl. 1*], [*figs.*] *325*).—This work, presented in 17 chapters and an appendix, aims to show how to plan the examination and interpret the finding in the examination and the manner in which the laboratory work is performed. The tables of cell identification are planned to guide the observer to the identity of even a hitherto unknown cell under the microscope. The tables of differential diagnosis are planned as a guide to the most probable diagnosis with the minimum expenditure of time. A list of references to the literature is included (pp. 209–228).

A textbook of hematology, W. Magner (*Philadelphia: P. Blakiston's Son & Co.,* [*1938*], *pp. XVI+395, pls. 3, figs.* [*26*]).—This work, presented in 17 chapters, includes a 5-page list of references.

Diseases of the blood and atlas of hematology, R. R. Kracke and H. E. Garver (*Philadelphia and London: J. B. Lippincott Co., 1937, pp. XVIII+532, pls.* [*52*], *figs.* [*6*]).—The several sections deal with hematologic terminology (pp. 3–40); the development and morphology of blood cells (pp. 43–101); leucocytosis and leucopenia (pp. 105–149); the anemias (pp. 153–296); the leukemias (pp. 299–349); hemorrhagic diseases (pp. 353–378); miscellaneous (pp. 381–451), among which are considered the blood groups and the blood picture of normal laboratory animals; and hematologic technic (pp. 455–517).

Practical bacteriology, haematology, and animal parasitology, E. R. Stitt and P. W. and M. C. Clough (*Philadelphia: P. Blakiston's Son & Co., 1938, 9. ed.,* [*rev.*], *pp. XIII+961, pls.* [*3*], *figs.* [*207*]).—A new edition of the work previously noted (E. S. R., 59, p. 169), the text of which has been rewritten.

A guide to human parasitology for medical practitioners, D. B. Blacklock and T. Southwell (*London: H. K. Lewis & Co., 1938, 3. ed.,* [*rev.*], *pp. VIII+259, pls. 2, figs. 122*).—A revised edition of a work first issued in 1931, presented in 23 chapters.

Veterinary helminthology and entomology, H. O. Mönnig (*London: Baillière, Tindall & Cox, 1938, 2. ed.,* [*rev.*], *pp. XVIII+409, pls. 12, figs.* [*242*]).—A thoroughly revised edition (E. S. R., 72, p. 528).

Textbook of experimental surgery, J. Markowitz (*Baltimore: William Wood & Co., 1937, pp. XV+527, figs. 330; rev. in North Amer. Vet., 19 (1938), No. 2, pp. 17–20*).—This work, with a foreword by D. C. Balfour, presented in 29 chapters and copiously illustrated, has for its purpose the presentation of some of the major accomplishments of experimental surgery and the demonstration in some detail of the technical procedures by which such knowledge is acquired.

Dollar's veterinary surgery, edited by J. J. O'Connor (*London: Baillière, Tindall & Cox, 1938, 3. ed., pp. IX+990, figs. 420*).—A revised and largely rewritten edition of this work (E. S. R., 66, p. 369).

Toxicology, W. D. McNally (*Chicago: Indus. Med., 1937, pp. XVI+1022,* [*pls. 5*], *figs. 29*).—Following general considerations, this work deals with inorganic poisoning; metals and nonmetals; gaseous poisons; alkaloidal poisons; volatiles, distillates, and solvents; drugs and miscellaneous; food poisoning and food-borne infections; death from powdered glass; blood; medicolegal examinations of seminal stains; hair and other fibers; medicolegal aspects of X-rays and other forms of radiant energy; silicosis and asbestosis; radium; and bites and stings, etc.

Textbook of meat inspection, J. Drabble (*Sydney and London: Angus & Robertson, 1938, 2. ed., rev., pp. XVII+383,* [*pls. 52*]).—A thoroughly revised edition of the work first published in 1936 (E. S. R., 77, p. 694), which deals with the subject in 22 chapters.

[Contributions on animal pathology and parasitology] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 9 (1937), Nos. 1, pp. 7–124, 185–201, 223–255, pls. 2, figs. 46; 2, pp. 289–598, 621–628, figs. 56; 10 (1938), No. 1, pp. 13–46, 49–190, figs. 282*).—The contributions here presented (E. S. R., 78, p. 694) are as follows:

Vol. 9, No. 1.—Eperythrozoonosis in Sheep (pp. 9–30), The Occurrence of *Piroplasma pitheci* in a Vervet Monkey (*Cercopithecus aethiops cloetei* Roberts) in South Africa (pp. 31–33), and The Transmission of Heartwater to and From Blesbuck (*Damaliscus albifrons*) by Means of the Bont-Tick (*Amblyomma hebraeum*) (pp. 37–46), all by W. O. Neitz; The Effects of Different Carbon Dioxide Concentrations on the Growth of Virulent Anthrax Strains—Pathogenicity and Immunity Tests on Guinea-Pigs and Sheep With Anthrax Variants Derived From Virulent Strains, by M. Sterne (pp. 49–67); Some Undescribed Species of the Nematode Genus *Physaloptera* Rud., Together With a Key to the Sufficiently Known Forms (pp. 71–84), A Hitherto Unrecorded Filaria, *Suifilaria suis* n. g. [and] n. sp., From the Domestic Pig in South Africa (pp. 85–89), and Whipworms From South African Ruminants (pp. 91–100), all by R. J. Ortlepp; The Approximate Distribution of the Genus *Glossina*, by H. H. Curson and W. O. Neitz (pp. 101–104); Experiments With Plants Alleged to be Used as Abortifacients and Ecbolics by Natives (pp. 107–109) and Recent Investigations Into the Toxicity of Known and Unknown Poisonous Plants in the Union of South Africa, VII (pp. 111–124) (E. S. R., 78, p. 100), both by D. G. Steyn; Notes Upon the Isolation of the Alkaloidal Constituent of the Drug "Channa" or "Kougoed" (*Mesembryanthemum anatomicum* and *M. tortuosum*) (pp. 187–191) and Chemical Investigation of the Plant *Acalypha indica*—Isolation of Triacetonamine, a Cyanogenetic Glucoside and Quebrachite (pp. 193–201), both by C. Rimington and G. C. S. Roets; and Studies Upon the Photosensitisation of Animals in South Africa—X, The Icterogenic Factor in Geel-dikkop—Isolation of Active Principles From *Lippia rehmanni* Pears, by C. Rimington, J. I. Quin, and G. C. S. Roets (pp. 225–255) (E. S. R., 78, p. 100).

Vol. 9, No. 2.—A New Piroplasm, *Sauroplasma thomasi* n. g. [and] n. sp., of a Lizard (*Zonurus giganteus* Smith), by P. J. du Toit (pp. 289–299); A New Blood Parasite of the Fowl [Found in New York and Pennsylvania], by J. D. W. A. Coles (pp. 301–307); South African Helminths, I, by R. J. Ortlepp (pp. 311–336); Cysticercosis in Swine and Bovines, With Special Reference to

South African Conditions, by N. F. Viljoen (pp. 337–570); Recent Investigations Into the Toxicity of Known and Unknown Poisonous Plants in the Union of South Africa, VIII, by D. G. Steyn (pp. 573–582) (see above); The Distribution and Possible Translocation of Icterogenin in *Lippia rehmanni* (Pears), by G. C. S. Roets (pp. 583–588); The Toxicity of Oil of Turpentine for Domestic Animals, by D. G. Steyn (pp. 591–598); and Veterinary Biochemical Studies—I, A Rapid Method for the Determination of Copper in Biological Material, by P. le R. Van Niekerk (pp. 623–628).

Vol. 10, No. 1.—Surfen C Therapy in *Trypanosoma congolense* Infection in Bovines and Ovines, by S. W. J. van Rensburg (pp. 13–20); Auto-Sterilization in Trypanosomiases, by B. S. Parkin (pp. 21–27); The Occurrence of *Grahamella couchi* sp. n. in the Multimammate Mouse (*Mastomys coucha*) in South Africa (pp. 29–32), The Destruction of *Piroplasma canis* by the Neutrophiles and Large Mononuclear Leucocytes (pp. 33–36), The Occurrence of *Nuttallia cynicti* sp. nov. in the Yellow Mungoose (*Cynictus penicillata*) in South Africa (pp. 37–40), and The Appearance of *Bartonella muris* (M. Mayer 1921) in the Albino and Wild Rat After Splenectomy (pp. 41–46), all by W. O. Neitz; and A Monograph of the Helminth Parasites of the Elephant, by O. P. van der Westhuysen (pp. 49–190).

[Contributions on animal pathology and parasitology] (*N. S. Wales Dept. Agr., Vet. Res. Rpt., 7 (1937), pp. 41–57, 64–122, pls. 3, fig. 1*).—Contributions presented (E. S. R., 66, p. 666) include the following: Studies on Cutaneous Myiasis (Blowfly Strike) of Sheep—I, Glycerine Diborate as a Preventive of Blowfly Strike of Sheep, by W. L. Hindmarsh and H. G. Belschner (pp. 41–43), and II, The Ingestion of Boric Acid as a Means of Prevention of Blowfly Strike in the Breech Region (pp. 44–48) and III, The Operative Procedure for the Control of Blowfly Strike of the Breech of Sheep (Mules' Operation) (pp. 49–57), both by H. G. Belschner and W. L. Hindmarsh; Ulcerative Granuloma of Pigs (Spirochaetal Tumours of Pigs), by W. L. Hindmarsh (pp. 64–70); Field Observations on Spirochaetosis of Poultry Transmitted by Red Mite [*Dermanyssus avium*], by T. G. Hungerford (pp. 71–73); A Short Note on the Transmission of the Fowl Spirochaete (*Treponema anserinum*) by "Red Mite" (*Dermanyssus gallinae*) (pp. 74, 75) and A Short Note on the Occurrence in New South Wales of Mycosis in Turkeys, Geese, and Fowls due to *Aspergillus fumigatus* (pp. 76, 77), both by L. Hart; Poisoning of Cattle by Ergotised Paspalum, by W. L. Hindmarsh and L. Hart (pp. 78–88); *Verbesina encelioides* (Crown Beard): A Plant Toxic to Sheep (pp. 89–94) and *Chenopodium atriplicinum* (Lamb's Tongue): A Plant Toxic for Sheep in the Immature Stages of Growth (pp. 95–100), both by R. O. C. King; Noogoora Burr (*Xanthium chinense*): Poisonous for Stock in Very Early Stage of Growth, by H. R. Seddon and R. O. C. King (pp. 101–108); *Castanospermum australe* (Black Bean, Moreton Bay Chestnut): Green Seeds Poisonous to Stock, by W. L. Hindmarsh and L. Hart (pp. 109–114); *Cestrum nocturnum:* A Plant Poisonous to Stock (pp. 115–117) and *Salvia coccinea:* A Garden Escape Poisonous to Stock (pp. 118, 119), both by W. L. Hindmarsh; and A Device Adopted for the Forced Feeding of Suspected Poison Plants at the Veterinary Research Station, Glenfield, by R. O. C. King (pp. 120–122).

[Livestock disease control], C. U. Duckworth (*Calif. Dept. Agr. Bul., 25 (1936), No. 4, pp. 411–424, fig. 1; 26 (1937), No. 4, pp. 359–373, fig. 1*).—The progress (E. S. R., 76, p. 689) of control work with diseases of livestock, particularly bovine tuberculosis and Bang's disease, in 1936 and 1937 is reported.

[Work in animal pathology by the Georgia Station] (*Georgia Sta. Rpt. 1938, pp. 54, 64*).—The work of the year reported relates to internal parasites (the twisted stomach worm *Haemonchus contortus* and the nodular worm

Oesophagostomum columbianum) in sheep and to the toxicity of peanut meal for swine.

[Contributions on animal parasitology]. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc., 5 (1938), No. 2, pp. 41, 42, 60–63*).—Among the contributions presented (E. S. R., 79, p. 535) are the following: On the Occurrence of *Gongylonema verrucosum* in Sheep and Cattle in the United States, by D. A. Porter (pp. 41, 42); The Influence of Infections With the Tapeworm *Raillietina cesticillus* on the Growth of Chickens, by P. D. Harwood and G. W. Luttermoser (pp. 60–62); and Persistence of Swine Lungworm Larvae in Earthworms, by L. A. Spindler (p. 63).

[Work in animal parasitology by the Puerto Rico Station], H. L. Van Volkenberg (*Puerto Rico Sta. Rpt. 1937, pp. 103, 104*).—The work of the year outlined (E. S. R., 78, p. 531) relates to an ant, *Pheidole fallax jelskii antillensis* Forel, as the intermediate host of a tapeworm of the chicken (*Raillietina* sp.); the snail (*Subulina octona*) as a host of the liver fluke of the cat (*Platynosomum concianum*); the inability of the infective stage of the pig hookworm (*Globocephalus urosubulatus*) to penetrate unbroken skin; several species of snails that act as intermediate hosts of one of the tapeworms of the chicken (*Davainea proglottina*); and trichomonad (*Trichomonas foetus*) abortions among cattle in Puerto Rico.

Recent advances in allergy (asthma, hay-fever, eczema, migraine, etc.), G. W. Bray (*London: J. & A. Churchill, 1937, 3. ed., pp. XV+517, pls. 4, figs. [103]*).—A comprehensive review of the present knowledge of allergy, presented in two parts, namely, allergy in general (pp. 1–190) and individual manifestations of allergy (pp. 191–485), representing 28 chapters accompanied by copious lists of references to the literature.

Histological technique for normal tissues, morbid changes, and the identification of parasites, H. M. Carleton and E. H. Leach (*London and New York: Oxford Univ. Press, 1938, 2. ed., pp. [2]+XVI+383, figs. 18*).—In this second edition (E. S. R., 56, p. 675) chapters 6 and 7, consisting of a general outline of the theory and practice of staining and on equipment for staining, respectively, have been written in collaboration with F. Haynes.

Blood cultures and their significance, H. M. Butler (*London: J. & A. Churchill, 1937, pp. XIV+327, [pls.] 3*).—The first three chapters of this monograph are devoted to the general aspects of the subject; the remaining 17, to consideration of the nature, duration, and significance of bacteremia in various diseases and to special methods of cultivation. A five-page list of references to the literature is included.

Parasites in slaughter houses in Canton.—III, Trematodes and cestodes parasitic in the alimentary tract of buffaloes, H. T. Chen (*Lingnan Sci. Jour., 16 (1937), No. 4, pp. 585–590, figs. 4; Chin. abs., p. 590*).—This continuation of the author's contribution (E. S. R., 78, p. 394) presents information on 5 trematode and 1 cestode parasites of buffaloes, together with a list of 14 references to the literature.

Helminth parasites of New Zealand, M. R. Young (*St. Albans, Eng.: Imp. Bur. Agr. Parasitol. (Helminthol.), 1938, pp. 19*).—A bibliography with alphabetical lists of authors, hosts, and parasites.

An attempt to elucidate the filtration of eggs of certain heterophyid trematodes into the general circulation, C. M. Africa (*Philippine Jour. Anim. Indus., 5 (1938), No. 2, pp. 187–201, pls. 3*).—This contribution is accompanied by a list of 15 references to the literature.

Studies on the nasal histology of epidemic influenza virus infection in the ferret, I–III (*Jour. Expt. Med., 68 (1938), No. 6, pp. 789–802, pls. 4; pp. 803–812, pls. 2; pp. 813–830, pl. 1, fig. 1*).—This contribution is presented in three parts as follows: (1) The Development and Repair of the Nasal Lesion, by T. Francis, Jr., and C. H. Stuart-Harris, (2) The Resistance of Regenerating Respiratory Epithelium to Reinfection and to Physicochemical Injury, by C. H. Stuart-Harris and T. Francis, Jr., and (3) Histological and Serological Observations on Ferrets Receiving Repeated Inoculations of Epidemic Influenza Virus, by T. Francis, Jr., and C. H. Stuart-Harris.

Report of the inoculation campaign against foot and mouth disease in the Bechuanaland Protectorate, 1934, W. H. Chase and J. H. N. Hobday (*Mafeking: Govt., 1935, pp. [1]+14; also in Vet. Jour., 92 (1936), No. 11, pp. 395–407*).—A report is made of an inoculation campaign commenced in May 1934 following the discovery of an outbreak of foot-and-mouth disease which appears to have freed the country of the disease, no further outbreak having been detected after 9 months' continuous inspection of the inoculated area.

Of the two methods of inoculation available the intranasal was selected as the most practicable under the circumstances, since the tongue inoculation would prolong the campaign by several months. The inoculum used consisted of blood virus fortified with finely macerated lesion (epithelium lymph) virus obtained from active lesions.

Complement fixation reaction and protective value of anti-hemorrhagic septicemia serum, M. M. Robles (*Philippine Jour. Anim. Indus., 5 (1938), No. 1, pp. 35–37*).—In experiments conducted hyperimmune antihemorrhagic septicemia serum, when injected in amounts containing from 10 to 60 complement-fixing units, protected only 2 out of 7 test rabbits. When the units were increased to 80, 2 out of 5 were adequately protected, and of 4 injected with from 120 to 160 units all survived.

Sylvatic plague, K. F. Meyer (*Amer. Jour. Pub. Health, 28 (1938), No. 10, pp. 1153–1164, fig. 1*).—This third report (E. S. R., 77, p. 105) deals with epidemiological observations for the year 1937 and presents the results of investigations.

Immunological reactions with a virus causing papillomas in rabbits, I–III, J. G. Kidd (*Jour. Expt. Med., 68 (1938), No. 5, pp. 703–759*).—This contribution is presented in three parts, namely, (1) Demonstrations of a Complement Fixation Reaction—Relation of Virus-Neutralizing and Complement-Binding Antibodies (pp. 703–724), (2) Properties of the Complement-Binding Antigen Present in Extracts of the Growths—Its Relation to the Virus (pp. 725–736), and (3) Antigenicity and Pathogenicity of Extracts of the Growths of Wild and Domestic Species—General Discussion (pp. 737–759).

Rabies in coyotes, G. E. Ledfors and W. E. Seiler (*Mil. Surg., 82 (1938), No. 5, pp. 400–402, fig. 1*).—The authors found the coyote to be responsible to a considerable degree in maintaining rabies in California. It is pointed out that due consideration should be given to all cases of coyote bites, since this animal propagates and spreads the disease to other canine species as well as to man.

Preservation and purification of dry rinderpest vaccine, T. Topacio, A. B. Coronel, and A. Valenzuela (*Philippine Jour. Sci., 65 (1938), No. 3, pp. 129–138*).—A description is given of an attempt to preserve and purify the dry rinderpest vaccine by fat extraction with ether.

Sulfanilamide in veterinary therapeutics, G. Labelle (*Vet. Med., 33 (1938), No. 11, pp. 488, 489*).—In the experimental use of sulfanilamide, mainly in the treatment of polyarthritis of young foals, a disease alarmingly frequent in the Province of Quebec where from 15 to 20 percent of the young animals are lost, some 200 subjects were employed. In 95 percent of the cases of polyarthritis, septicemia of the newborn, and omphalophlebitis, with or without complications, complete cures were obtained promptly. In 2 foals affected with septicemia with pneumonia as a complication, recovery occurred only after 12 and 15 days, respectively. The dosage of the drug administered was 1 g five times daily at 3-hr. intervals the first day and decreased to 4, 3, 2, and 1 times daily, respectively, on succeeding days. Sulfanilamide was also experimented with in the treatment of other bacterial diseases, with encouraging results.

The isolation of Actinomyces bovis from tonsillar granules, C. W. Emmons (*Pub. Health Rpts. [U. S.], 53 (1938), No. 44, pp. 1967–1975, pl. 1*).—The author reports isolation of the so-called ray fungus *A. bovis*, the cause of lumpy jaw or actinomycosis of cattle, from 37 percent of an unselected series of 200 pairs of tonsils from routine tonsillectomies. None of these patients suffered from actinomycosis, and it is considered probable that *A. bovis* is commonly present in the normal mouth and throat and becomes pathogenic only under abnormal conditions. A list is given of 33 references to the literature.

Myiasis caused by the larvae of Booponus intonsus Ald. in cattle [trans. title], F. C. Kraneveld and A. van der Schaaf (*Nederland, Indische Bl. Diergeneesk., 49 (1937), No. 5–6, pp. 360–369, pls. 4; Ger., Eng. abs., pp. 368, 369*).—A description is given of myiasis caused by the foot maggot *B. intonsus* in cattle in certain regions of the Minahassa in North Celebes, the parts of the skin bordering on the hoofs and false hoofs being principally attacked. It is pointed out that this condition was described by Woodworth and Ashcraft from the Philippines in 1923 (E. S. R., 51, p. 383).

The incidence of Salmonella enteritidis var. dublin in pyosepticaemia of calves in India, V. R. Rajagopalan (*Indian Jour. Vet. Sci. and Anim. Husb., 8 (1938), No. 1, pp. 33–40*).—An organism isolated from cases of pyosepticemia in calves at Lahore was typed as *S. enteritidis dublin* after a detailed study of its morphological, cultural, and biochemical properties, as also of its antigenic constituents.

The significance of human double zone beta hemolytic streptococci in the udder of the cow, R. B. Little (*Jour. Expt. Med., 68 (1938), No. 6, pp. 905–911, figs. 2*).—It was found that human strains of double zone β-hemolytic streptococci, when inoculated into the udders of 4 young cows, were capable of inducing mastitis in 11 quarters. Following the acute phase of the infection, the streptococci were eliminated from 6 quarters at various intervals. Sufficient positive infections were maintained throughout the period of observation to show that the human strains can produce the same degree of infection as bovine double zone β-hemolytic streptococci.

A review of the literature on the trichonomads of the genital organs of cattle, J. Steinhaus (*Die Geschlechstrichomonaden des Rindes im Schrifttum. (Diss., Hess. Ludwigs-Univ., Giessen, 1937, pp. 52*).—This review is presented with a list of 157 references to the literature.

Bovine genital trichomoniasis, with special reference to diagnosis, G. Dikmans and L. J. Poelma. (U. S. D. A. and Univ. Md.). (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 6, pp. 362–366*).—The nature of the disease caused by *Trichomonas foetus*, including the manner of transmission, course of infection, clinical symptoms, diagnosis, and control and treatment, together with a brief consideration of this organism as the cause of bovine trichomoniasis, is considered.

The incidence of Trichomonas foetus Riedmuller in Utah cattle.—Preliminary report, D. M. Hammond and R. Jensen (*Utah Acad. Sci., Arts, and Letters, Proc., 15 (1937–38), pp. 133, 134*).—A brief account of trichomoniasis, which was found present in the dairy herds of the Utah State Agricultural College in 1936 and subsequently in other herds of Cache Valley, both beef and dairy types. Herds in Davis and Utah Counties were also diagnosed as definitely positive. Since that time symptoms have persisted in these herds, but repeated attempts to demonstrate the organism have failed. The infection is believed to have an extensive range in the State.

The so-called skin-tuberculosis in cattle [trans. title], G. T. KRANTZ (*Skand. Vet. Tidskr.*, *28* (*1938*), *No. 1*, *pp. 1–23*, *figs. 2; Eng. abs.*, *pp. 20, 21*).—An account is given of 40 cases of skin lesions in tuberculin-reacting cattle from Gotland, this being the first report of such alterations observed in Sweden. A list is given of 44 references to the literature.

Lamb diseases in Colorado feedlots, I. E. NEWSOM and F. THORP, JR., (*Colorado Sta. Bul. 448* (*1938*), *pp. 42, figs. 26*).—This bulletin, which has been prepared for the feeder and veterinarians who practice in lamb-feeding districts, briefly describes the more common causes of loss in lambs on winter feed. A list of 33 references to contributions from the station on sheep diseases is included.

The species of Diptera concerned in cutaneous myiasis of sheep in Britain, J. MACLEOD (*Roy. Ent. Soc. London, Proc., Ser. A, 12* (*1937*), *No. 10–12*, *pp. 127–133*).—Studies conducted confirm the earlier findings of Haddow and Thomson (E. S. R., 77, p. 854) that species other than *Lucilia sericata* (Meig.) may occasionally strike sheep. These alternative species were found to occur frequently in Scotland (27 out of 68 cases), and they must, therefore, be regarded as important. They are said to occur less frequently in England. Three alternative species recorded from Scotland are *L. caesar* (L.), *Calliphora erythrocephala* (Meig.), and *Phormia terrae-novae* (Rob.-Desv.), the first two of which were also obtained in England. "*L. caesar* was found to be a more commonly occurring species than *C. erythrocephala*. *P. terrae-novae* appears to be confined to western Scotland, and to occur only in the early part of the season. Experimental and inferential evidence is given in support of the contention that *L. caesar* and *P. terrae-novae* belong to the category of primary striking flies, whilst *C. erythrocephala* is a true secondary striking fly. *C. vomitoria* is held to be, at most, a tertiary striking fly."

Diseases of sheep and goats, with special reference to Cyprus, R. MOYLAN GAMBLES (*Cyprus Agr. Jour.*, *31* (*1936*), *No. 4*, *pp. 133–140*; *32* (*1937*), *Nos. 1*, *pp. 12–18*; *2*, *pp. 49–52*).—Brief accounts are given of infectious and parasitic diseases of sheep and goats in Cyprus.

Goat-pox and infectious vesicular verrucose eruptions in sheep and goat [trans. title], L. SLAGSVOLD (*Skand. Vet. Tidskr.*, *28* (*1938*), *No. 8*, *pp. 471–495*, *figs. 2; Eng. abs.*, *pp. 493–495*).—The author has found goat pox and infectious vesiculous verrucose eruptions in sheep and goats, common diseases in Norway, to be similar from a clinical standpoint, inoculation experiments having failed to demonstrate any difference between the two. The virus appears to be peculiar to goats and sheep and seems not to affect other domestic animals.

Avian tubercle bacilli in the udder of a goat: Change of S to R forms, A. S. GRIFFITH (*Jour. Compar. Path. and Ther.*, *51* (*1938*), *No. 3*, *pp. 151–165*).—These studies relate to a strain of avian tubercle bacillus which had localized in the right half of the udder of a goat soon after the subcutaneous injection of a culture, persisted there for a period of about 9 yr., and was grown on successive occasions from the udder secretions. "During the residence of the strain in the udder there was a change from the S to the R form of the avian bacillus. The R form first appeared as an admixture in a culture made 8.5 yr. after the injection of the goat and was the only form in the last positive culture obtained 8 mo. later. The R form differed from the S form in cultural characters and in agglutinability and agglutinin absorption. No differences in virulence between the two forms were shown in experiments on fowls, rabbits, and guinea pigs. The goat died 11 yr. after injection. The right half of the udder was atrophied and showed no sign of tuberculosis either macroscopically or microscopically."

Erythema multiforme: A disease of the skin in swine, H. C. H. Kernkamp and W. L. Boyd. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 6, pp. 392, 393, fig. 1*).—The authors found that the most striking feature of a disease of the skin resembling the circinate or annular type of erythema multiforme of humans, observed in members of a litter of purebred Poland China pigs, consisted of well-defined, circumscribed, ringlike, edematous swellings in the skin, with somewhat depressed central areas containing exfoliating, dry, crusty portions of epidermis. The cause of the disease was not definitely established.

The resistance of the swine fever virus to physical agencies and chemical disinfectants, G. Slavin (*Jour. Compar. Path. and Ther., 51 (1938), No. 3, pp. 213–224*).—A study made of the viability of the hog cholera virus in acid and alkaline media has shown the virus to be very resistant to changes in the H-ion concentration. The resistance of the virus to chemical disinfection was tested by a new method which gives consistent results and has shown it to be destroyed in 15 min. by a 5-percent solution of pure phenol and by a solution of hypochlorite containing 1.66 percent of available chlorine. It was found that the virus when present on brick and hay exposed to atmospheric influences survives only a few days.

The occurrence in nature of "equine encephalomyelitis" in the ring-necked pheasant, E. E. Tyzzer, A. W. Sellards, and B. L. Bennett (*Science, 88 (1938), No. 2291, pp. 505, 506*).—The authors report upon a series of cases of equine encephalomyelitis in pheasants from a locality in Connecticut which demonstrate natural occurrence of the infection in game birds. It is pointed out that a search for spontaneous infection in migratory birds is indicated.

A text-book of the diseases of the small domestic animals, O. V. Brumley (*Philadelphia: Lea & Febiger, 1938, 3. ed., rev., pp. 597*).—A revised and largely rewritten edition of this work (E. S. R., 69, p. 709).

Attempt to immunize dogs against infection with Dirofilaria immitis Leidy 1856, L. C. Feng (In *Festschr. Bernhard Nocht zum 80. Geburtstag. Hamburg: Friederichsen de Gruyter & Co., 1937, pp. 140–142*).—Experiments were conducted on three dogs in order to determine whether or not they could be immunized against heart worm (*D. immitis*) infection by subcutaneously injecting emulsions of the parasite. One dog which had received 20 cc of a 10-percent saline emulsion of dried male *D. immitis* was found to harbor parasites in its heart 8 mo. after infective larvae from mosquitoes had been introduced subcutaneously. One dog treated with 39 cc of a 10-percent saline emulsion of dried female worms died about 2 mo. after infective larvae had been similarly introduced. No parasites were found in the heart of this dog, a fact which is possibly due to the short period between infection and death of the dog. One control dog which had received no emulsion became infected in a similar degree as the dog treated with emulsion of male worms after infective larvae had been introduced.

Mammalian heart worms of the genus Dirofilaria, E. C. Faust (In *Festschr. Bernhard Nocht zum 80. Geburtstag. Hamburg: Friederichsen de Gruyter & Co., 1937, pp. 131–139, fig. 1*).—This report of a study includes biological, pathological, and morphological data on filariae collected from the heart of the dog, cat, wolf, fox, and California sea lion. A list is given of 26 references to the literature.

A rare type of malignant endothelioma of the liver of a dog, E. T. HALLMAN. (Mich. State Col.). (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 6, pp. 390, 391, figs. 3*).

A survey of canine thelaziasis in California, J. R. DOUGLAS. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 6, pp. 382–384, fig. 1*).—The survey here reported and previous knowledge of canine thelaziasis have led to the following conclusions: "(1) The parasites are rather widely distributed in California, especially in wild areas. (2) *Thelazia californiensis* has not been reported outside of California, but it probably occurs in other areas. The distribution as shown . . . would lead one to expect its occurrence in Oregon, Nevada, Mexico, and perhaps also in other areas. (3) Thelaziasis is not rare; as a result of increased attention more cases are being reported each year. (4) Most of the cases are noted in winter and spring. The time of infestation is unknown. (5) The life history of the parasite is unknown. It appears quite possible that an arthropod vector is involved, although experiments seeking to confirm this belief have been negative. (6) It would appear probable that should an arthropod vector be involved, it will be one associated with wild areas somewhat removed from centers of population."

Poisoning of dogs by the giant toad (Bufo marinus): Its treatment with nembutal, C. R. TURBET (*Austral. Vet. Jour., 14 (1938), No. 4, pp. 152, 153*).—An account is given of the poisoning of a dog by the product of poison glands situated on each side of the neck of *B. marinus*. Symptoms resembling strychnine poisoning were overcome by the injection of 1.5 grains of nembutal, and they had disappeared when the animal recovered from nembutal narcosis in about 6 hr. Two additional cases were treated in the same manner with similar results.

Preliminary report on infectious avian encephalomyelitis, H. VAN ROEKEL, K. L. BULLIS, and M. K. CLARKE. (Mass. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 6, pp. 372–375*).—Account is given of an avian disease described by Jones in 1932 (E. S. R., 71, p. 702) as epidemic tremor or encephalomyelitis, the incidence of which during the last few years has increased, its most frequent occurrence being met with in the New England States. The disease can be transmitted to normal chicks by the intracerebral inoculation of brain suspensions prepared from affected chicks. Details of inoculation experiments with chicks are reported in three tables. It has been reproduced in maturing birds through intracerebral inoculation. The causative agent was found to remain infective for young chicks upon a single passage through a young turkey poult. Limited experiments failed to demonstrate that surviving stock of an outbreak of the disease might act as a reservoir of the infection. However, field and laboratory evidence suggests that the infective agent may be egg-borne and that the breeding stock serves as the reservoir of the infection.

Fowl leukemia induced by adverse atmospheric conditions, M. W. EMMEL. (Fla. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 6, pp. 387, 388*).—This brief account supplements the work previously noted (E. S. R., 78, p. 256; 80, p. 400).

Studies on fowl spirochetosis, I, II, I. J. KLIGLER, D. HERMONI, and M. PEREK (*Jour. Compar. Path. and Ther., 51 (1938), No. 3, pp. 197–212*).—This contribution is presented in two parts.

I. *Immunisation of chickens with Spir[ochaeta] gallinarum* (pp. 197–205).—Experiments conducted in Palestine, which have shown that it is possible to immunize chickens against spirochetal infections by two methods, are reported. One of the procedures consists in the use of formalized cultures, one dose of 5 cc being sufficient to produce immunity. The other procedure utilizes immune serum and live spirochetes, 0.5 cc of serum being given first followed shortly by an injection of 0.25 cc of defibrinated infected blood. Both methods have been employed in the field with promising results, the latter procedure being particularly applicable during epidemic outbreaks since it affords both passive and active immunity.

II. *Presence of serologically differentiated types of spirochetes* (pp. 206–212).—Experiments are reported which demonstrated that there are a number of strains of fowl spirochetes existing in Palestine which are antigenically distinct. Chickens immunized with a given strain are definitely immune to an infection with the homologous strain but remain susceptible to an infection with a heterologous strain. The vaccines induce the production of spirocidal substances. These disappear progressively from the circulation, but their disappearance does not indicate loss of immunity. Thus far it has been found that the immunity lasts at least 6 mo.

Organisms of a malarial type in ruffed grouse, with a description of the schizogony of Leucocytozoon bonasae, C. H. D. Clarke (*Jour. Wildlife Mangt., 2 (1938), No. 3, pp. 146–150, pl. 1*).—The author has found an undetermined form of *Haemoproteus* not hitherto recorded from ruffed grouse in blood smears from two specimens collected at Pancake Bay, Ontario, Canada.

Atypical botulism in turkeys, D. R. Coburn and E. R. Quortrup. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 6, pp. 385–387, figs. 2*).—Findings in two domestic turkeys obtained during the course of a study of botulism, as occurring in wild waterfowl and shore birds in Utah, are briefly reported. The work has shown that botulism is common in the area in which the investigation was made and that the causative organism *Clostridium botulinum* type C is present and may be isolated from the soil. The clinical symptoms displayed were different in the fowl observed from those previously observed by the authors in other birds.

On the nutrition of the fowl nematode Ascaridia lineata (Schneider), J. E. Ackert. (Kans. Expt. Sta.). (*Amer. Micros. Soc. Trans., 57 (1938), No. 2, pp. 218–232*).—Immature worms grown in their normal habitat, the duodenum of chickens, were transferred into the body cavities of other chickens to see if the nematodes could feed upon tissue or lymph. "Of a total of 142 live *A. lineata* transferred into the body cavities of 31 chickens, 81 of the nematodes were recovered; of these, only 16 worms remained viable for from 1 to 4 days. Nearly all of the worms recovered were phagocytized, encapsulated, or walled off by some portion of the fowl's body. The worms were unable to thrive outside the lumen of the intestine. The occasional occurrence of *A. lineata* in the hen's egg obviously is due to migration of the adult worm through the lumina of the large intestine, cloaca, and oviduct rather than to the entrance through the oviducal infundibulum of a migrating larva grown to maturity in the body cavity."

AGRICULTURAL ENGINEERING

Surface water supply of the United States, 1936, parts 1, 3 (*U. S. Geol. Survey, Water-Supply Papers 801 (1938), pp. VIII+402, pl. 1; 803, pp. VII+453, pl. 1*).—These papers present the results of measurements of flow made on streams during the year ended September 30, 1936, No. 801 covering the North Atlantic slope basins and No. 803 the Ohio River Basin.

Surface water supply of the United States, 1937, parts 4, 12, 13, 14 (*U. S. Geol. Survey, Water-Supply Papers 824 (1938), pp. IV+150, pl. 1; 832, pp. V+173, pl. 1; 833, pp. VI+221, pl. 1; 834, pp. V+188, pl. 1*).—These papers present the results of measurements of flow made on streams during the year ended September 30, 1937, No. 824 covering the St. Lawrence River Basin, No. 832 the Pacific slope basins in Washington and upper Columbia River Basin, No. 833 the Snake River Basin, and No. 834 the Pacific slope basins in Oregon and lower Columbia River Basin.

The rubber tired farm wagon, E. C. Sauve (*Michigan Sta. Quart. Bul., 21 (1938), No. 2, pp. 110–112, pl. 1*).—Photographic cuts showing complete assembly views of (1) a conventional farm wagon converted on rubber tires, (2) a built-up wagon using car front axles and fabricated chassis construction, and (3) a modification of wagon (2) are presented and described.

Electric dairy water heater and utensil sterilizer, D. G. Ebinger (*Michigan Sta. Quart. Bul., 21 (1938), No. 2, pp. 93–96, figs. 2*).—A portable combination electric water heater and sterilizer designed by the station is described and illustrated.

AGRICULTURAL ECONOMICS

Agricultural economics, 1913–1938 (*Univ. Oxford, Agr. Econ. Res. Inst. Ann. Rpt., 25 [1937], pp. 79, [pls. 13, figs. 2]*).—The progress since its foundation of the research of the Agricultural Economics Research Institute in economic problems of land and its use is reviewed. A list of its publications is included.

References on American colonial agriculture, E. E. Edwards (*U. S. Dept. Agr., Library, Bibliog. Contrib. 33 (1938), pp. V+101*).—Included are 9 references to bibliographies; 43 on American Indian contributions, English agricultural practices, Dutch influences, and French and Spanish contributions; 62 on land policies to 1776; and 143 on the agriculture of the 13 English colonies.

Agricultural outlook for Illinois, 1939 (*Illinois Sta. Circ. 488 (1938), pp. 32, figs. 15*).—"The Illinois agricultural outlook for 1939 contains statements of certain economic facts, which if understood and applied by Illinois farm families will enable them to secure a higher level of living than they would otherwise obtain from the farm business." It is based largely on data prepared by the U. S. Department of Agriculture. The general outlook situation—domestic demand, foreign trade, farm credit, Illinois farm conditions, farm equipment and supplies, and Illinois farm family living; the outlook for different feed grains and other feeds—wheat, broomcorn, soybeans, and forage crop seeds; livestock and livestock products; dairying; fruits; vegetables; and forestry are discussed.

A study of land utilization in Newport and Bristol Counties, Rhode Island, B. E. Gilbert (*Rhode Island Sta. Bul. 268 (1938), pp. 40, figs. 13*).—This is the second report of the series previously noted (E. S. R., 77, p. 870). The areas are described, and tables, charts, and maps show by towns the land uses, the acreages in different crops and fruits, kinds of timber, etc., the soil types and estimated acreages of different cover types on different soils, and estimated acreages of lands classified as adapted to commercial agriculture for intensive farming and for livestock and dairy farming, to forestry uses, and not adapted to agriculture or forestry uses.

Land use problems in Crockett County, Tennessee, C. E. Allred and P. T. Sant. (Coop. U. S. D. A.). (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 72 (1938), pp. [1]+III+43, figs. 11*).—Using data obtained in a survey in 1936 including 112 farms, the relations of soil erosion to soil types, slope, land use. and other factors are discussed, and suggestions are made for land use in the county.

Production requirements for crops and livestock in the bluegrass region of Kentucky, W. L. Rouse and G. B. Byers (*Kentucky Sta. Bul. 383 (1938), pp. 125–223, figs. 22*).—This study was made to determine the physical requirements and production obtained in each farm enterprise in the bluegrass region of

Kentucky. In addition the costs and returns for each crop and livestock enterprise and for the farm as a unit were determined. The area studied was confined to farms in seven counties in the inner bluegrass region of the central part of the State. The periods covered were 1921–29 and 1932–36. During the first period the complete-cost method was used, detailed records being kept by farmers with the assistance of a route man. For the period 1932–36 the data were compiled from livestock-enterprise records. Complete cost records were kept by 27 farmers covering from 1 to 9 yr. In addition to enterprise records, livestock data were obtained from 57 farmers covering from 1 to 13 yr.

The importance of pasture in the utilization of tillable land; the tillable land occupied by selected crops; yields of corn, tobacco, and hay; numbers of livestock; and the distribution of man labor and horse work for crops and livestock are discussed. An analysis is made of the man labor, horse work, and material used, and the production requirements for tobacco, corn, corn silage, wheat, rye, barley, oats, soybeans, soybean hay, alfalfa, red clover, timothy, bluegrass, sheep, beef cows, feeder cattle, dairy cows, young dairy stock, dairy herd bull, hogs, chickens, and work stock, and the relation of each enterprise to other enterprises is discussed. The proper crop and livestock balance for the area is discussed.

Factors for profitable farming on limestone hill land of the Eden formation in Kentucky, J. H. Bondurant (*Kentucky Sta. Bul. 384* (*1938*), *pp. 225–246, fig. 1*).—An analysis is made of data for the year 1935, gathered by interviewing operators of 134 farms in the hill section of Anderson, Garrard, Mercer, and Washington Counties in the limestone hill region of the intermediate blue-grass area. The report deals principally with 94 farms with from 85 to 100 percent of the land Eden silty loam and Eden stony clay loam or similar soil and with 8 percent or less bottom land.

Productive man-labor unit was the most important single factor determining labor income, proportion of land in open pasture the next in importance, and receipts per productive animal unit third. The farms with all of these factors above the average had an average labor income of $479 as compared with $27 for the farms with none of the factors above the average. The farms most profitably operated contained from 90 to 150 acres and used from 300 to 500 productive man-labor units. The most profitable utilization of land was found when approximately one-sixth of the acreage was used for alfalfa hay, from one-half to two-thirds for open pasture, less than one-tenth for brush pasture, and one-tenth or less of the tillable land for intertilled crops.

Factors affecting the place of sheep on Kentucky farms, G. B. Byers and D. E. Bayless (*Kentucky Sta. Bul. 385* (*1938*), *pp. 247–278, figs. 8*).—Tables and charts are included and discussed showing the lamb and wool production, the feed, labor, and other productive requirements, and the methods of flock management practiced by farmers who cooperated in the study. During one or more of the years 1932–36, inclusive, 47 farmers in 7 counties typical of the inner bluegrass area and 111 farmers in part of Owen County typical of the outer bluegrass area furnished detailed cost of production records for their flocks of sheep. During one or more of the years 1933–36, inclusive, 18 farmers in the part of Meade County in the Eastern Pennyroyal and Knobs type-of-farming area also cooperated.

Equipment expense per acre on farms in Nebraska 1926–1930 and 1932–1936, A. W. Medlar (*Nebraska Sta. Bul. 319* (*1938*), *pp. 26, figs. 5*).—In cooperation with the agricultural extension service of the State 2,096 farm records were obtained and analyzed for the period 1926–30 and 4,588 for the period 1932–36. Equipment expense for the farm is defined as "the beginning inventory plus the value of machinery bought, of repairs for tractors, trucks, and general farm equipment, and one-half of the expense for fuel, oil, repairs, and license for the automobile minus the closing inventory, the income from equipment hired out, and the income from sales or exchange of any farm equipment."

The equipment expenses per acre for the first period were for owners $2.03, part-owners $1.89, and tenants $1.99. For the second period they were $1.47, $1.02, and $1.19, respectively. Equipment expenses declined with size of farm with each kind of tenure. Tenants had the lowest expense per acre on all except the largest farms and part-owners the highest on farms less than 161 acres. The higher expense in the first period was due to larger investment resulting from increased use of automotive farm machinery and to smaller sized farms. Adverse crop conditions in the second period resulted in less purchase of machinery and reduced equipment expenses. Expenses were lower on part-owner farms, largely because of larger acreage.

Some economic characteristics of owner-operated farms in South Carolina, G. H. Aull (*South Carolina Sta. Bul. 316* (*1938*), *pp. 31*, *figs. 6*).—An analysis is made of the records from 512 white owner and 162 Negro owner farms in 8 counties of the State representative of the different type-of-farming areas. The data were for the year 1933 and were obtained in cooperation with the C. W. A. in a study of land utilization in the State. In the analysis the principal groupings are by type-of-farming area, size of farm, investment per farm, and income per farm. In each group analysis was also made of the relation to size, investment, farm income, and taxes paid for all farms and for the white-owned and Negro-owned farms.

"It appears from these studies that the small farms have relatively large investments, receive farm incomes which are low in proportion to investments, and pay taxes which are about on a par with investments but high in relation to income. Farms with small investments report relatively small incomes and relatively high taxes, while the reverse is true in the case of farms with large investments. The farms which failed to show any excess of receipts over expenditures had less than their proportionate share of the acreage and less than their proportionate share of investments, but paid more than their proportionate share of the taxes. On the other hand, farms which reported incomes of $500 and above showed relatively large acreages and high investments but paid taxes which were relatively low both in proportion to income and to investment."

Organization and earnings on 130 sugar cane farms in Puerto Rico, 1934–35, S. L. Descartes (*Puerto Rico Col. Sta. Bul. 47* (*1938*), *pp. 60*, *figs. 9*).—An analysis is made of data for the crop year 1934–35, obtained by the survey method, for 130 farms operated by individual farmers. The farms represented middle-sized and large sugarcane farms with from 10 to 500 cuerdas (cuerda=0.97 acre), and no farm was included which received less than 40 percent of its income from sugarcane. The organization of the sugar industry in Puerto Rico and the physical and economic factors affecting it are described. An analysis is made of the farm organization, of the farm included, and of the factors influencing labor income.

The farms averaged 193 cuerdas, of which 99 were in crops, and of the crop lands 82 cuerdas were planted to sugarcane. Of the 82 cuerdas in sugarcane, 50 were harvested for sugar, 4 for molasses, and 28 were left uncut. The average farm capital was $26,724. Sale of crops averaged $6,901 per farm and A. A. A. compensation payments for sugarcane left uncut $3,556 per farm. Total income from sugarcane constituted 88 percent of the operators' receipts. Operators' labor incomes averaged $3,512. Of the farmers, 11 percent had negative labor incomes, 27 percent less than $1,000, and 11 percent above $10,000. An average of 17 percent was earned on total capital invested. Direct relationships were found between labor income and size of business as measured by cuerdas in sugarcane, tons of sugarcane, and yields of sugarcane. Farms with the larger area and the more specialized farms had the higher labor incomes. One of the most profitable combinations for a farm was to have above the average in number of cuerdas in sugarcane and in yield of sugarcane per cuerda and below the average in labor costs per $100 of gross receipts.

Studies in Vermont dairy farming.—XI, Labor as a cost of milk production, J. A. Hitchcock and L. N. Paquette (*Vermont Sta. Bul. 442 (1938), pp. 16, figs. 4*).—This bulletin continues the series previously noted (E. S. R., 77, p. 869). It analyzes the relations of production per cow, size of herd, use of milking machines, type of market, and age of operators to labor usage and cost of labor per 100 lb. of milk.

An average of 137 hr. of labor per cow per year were used in milking, feeding, and caring for cows, of which milking used 52, barn chores 39, washing and caring for utensils 6, and miscellaneous items 3 percent. Of the 137 hr., 87 were used in the winter season (200 days) and 50 in the pasture season (165 days). The average number of hours of labor increased from 122 for the herds with an average production of 4,500 lb. of milk per cow to 153 for herds averaging over 6,500 lb. per cow, but the hours of labor per 100 lb. of milk decreased from 3.1 to 2.1 and the cost of labor from 58 ct. to 40 ct. The hours of labor and cost per 100 lb. of milk decreased from 3.3 hr. and 62 ct. for herds of less than 15 cows to 2.1 hr. and 41 ct. for herds of 35 cows or more. On an average, milking took 30 hr. less per cow in herds milked by machine the whole year than in herds milked entirely by hand. The labor per cow and per 100 lb. of milk was 134 and 2.4 on the 80 farms selling grade A milk and 138 and 2.6 hr., respectively, on those selling grade B milk. Hours per cow increased from 125 where the farm operators were less than 40 yr. of age to 143 hr. where they were 50 yr. of age or older, but part of the difference was due to the fact that the farms operated by the older owners tended to be smaller.

Range conditions in the Uinta Basin, Utah: An interagency range report, L. A. Stoddart, P. B. Lister, G. Stewart, T. D. Phinney, and L. W. Larson. (Coop. U. S. D. A. et al.). (*Utah Sta. Bul. 283 (1938), pp. 34, pls. 3, figs. 11*).—This is the first report on a study of the economic, soil and crop, irrigation and drainage, and range aspects of the agricultural resources and their utilization in Uintah, Duchesne, and Utah Counties, Utah. The settlement and range use in the area and the method used in the study in making a range forage inventory are described. The land ownership classes in the area, the climate of the area and its relation to range productivity, vegetation and vegetative zones, the forage supply and grazing capacity, the present condition of range lands, the deterioration due to premature use and overgrazing, soil erosion in the basin, the influence of range conditions on the success or failure of the range livestock industry, and the range and livestock data obtained in the study are discussed. Some of the findings are summarized as follows:

"Early misuse of the range lands coupled with a period of abnormally low precipitation have brought about on the lower ranges marked reductions in palatable forage and serious increases in erosion. Observations over large areas of the lowlands showed that none of the ranges outside national forests was making permanent improvement, and that more than 85 percent of the lower ranges was deteriorating still further. On more than 60 percent of this land area, erosion was dangerously accelerated. Tremendous losses of both water and topsoil occurred, which conditions are serious because the area is already limited in both of these vital resources.

"Range capacity studies indicated that the lower ranges of Uinta Basin have been supporting livestock numbers far beyond their capacity, though national forests are stocked at their approximate capacity. In 1937 the estimated grazing capacity for spring, fall, and winter ranges was only about 50 percent adequate for the stock grazed on them. An equally serious lack of balance was discovered between seasonal forage demand and proper seasonal use of range lands. Most serious was the winter range, which makes up only 22.5 percent of the total grazing capacity which must be used for 45.8 percent of the year.

"It was concluded that in order to effect a balance between the available range-forage resources and the stock-grazing demand in the Uinta Basin, some combination of the following adjustments would be needed: (1) More supplemental feeding on the range, (2) increased farm feeding, (3) some shifts in seasonal use of ranges and other improvements in range management practices, and (4) reduction in the stock grazed on spring, fall, and winter ranges."

Foreign Agriculture, [November 1938] (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr., 2 (1938), No. 11, pp. 487–548, figs. 8*).—Included are articles on Government Aid to Wheat Producers, by D. F. Christy (pp. 489–504), and The Market for American Tobacco in the Scandinavian and Baltic Countries, by P. G. Minneman (pp. 505–544), and notes on recent developments in foreign agricultural policy as follows: Turkey invites exhibitors of agricultural machinery to Ankara, Argentina provides for liquidation and refinancing of mortgage debts, Mexico establishes government price control, and Chile to make loans to small farmers.

British agriculture: The principles of future policy, Viscount Astor and B. Seebohm Rowntree (*London and New York: Longmans, Green and Co., 1938, pp. XX+469, figs. 20*).—This is the report of an inquiry organized by the authors. The technical factors relating to agricultural development and the social, economic, and political considerations involved in the problem concerned with future policy were included in the inquiry. Part 1, preliminary survey, includes in addition to an introductory chapter, chapters on objectives of agricultural policy and the changing structure of British agriculture, 1866–1938. Part 2, crops, includes chapters on grass, grain crops, roots and sugar policy, feeding stuffs, potatoes and hops, other vegetables, and fruit. Part 3, livestock products, includes chapters on cattle, sheep, pigs, poultry, and milk production and marketing. Part 4, personnel and organization, includes chapters on the agricultural worker, small holders, farmers, agricultural credit, landlords, and research, education, and advice. Part 5 summarizes the main features of the proposals and suggestions made.

Rural tax delinquency in New Jersey, 1929–1934 (*Trenton: N. J. State Planning Bd., 1938, pp. 65, [pls. 3]*).—The findings, conclusions, and recommendations are reported of a study made to determine the extent and distribution of rural tax-delinquent land in New Jersey; the concentration of such lands as possible indicators of agricultural problems such as poor quality or condition of soil, uneconomic size of farms, lack of diversification, and excessive taxation; and the coincidence of tax-distressed lands and the needs of the State for lands for public purposes.

The North Dakota rural credit system, G. W. Cooke (*Jour. Land and Pub. Util. Econ., 14 (1938), No. 3, pp. 273–283, figs. 2*).—The political and legislative background of the system, its administration, the allocation, collection, and delinquency of loans made, causes for delinquency, and the condition of the bonds issued are discussed.

Rural credit in Tennessee, 1923, C. E. Allred, J. L. Robinson, and B. H. Luebke (Coop. U. S. D. A.). (*Tennessee Sta., Agr. Econ. and Rural Sociol.*

Monog. 82 (1938), pp. [1]+III+48, figs. 42).—Data regarding mortgage, short-term cash, and merchant credit, obtained in a survey made in 1923 and covering 600 farms in 5 counties in Tennessee, typical of important agricultural areas of the State, are analyzed.

Farm credit in Canada, W. T. EASTERBROOK (*[Toronto]: Univ. Toronto Press, 1938, pp. XI+260*).—Part 1, farm credit to 1917 (pp. 3–66), sketches the history of farm credit up to the advent of provincial lending agencies in 1917 in chapters on before confederation, agricultural development in the St. Lawrence region, and western expansion. Part 2, governments and farm credit (pp. 69–166), is discussed in chapters dealing with measures in the several provinces, Federal measures, and debt adjustment. Pages 169–254 include notes on the two parts.

Cooperative purchasing of farm supplies in Mississippi, J. H. LISTER and G. M. FRANCIS (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 22 (1938), pp. IV+59, figs. 9*).—The effects of economic and agricultural conditions in the State on the development of agricultural cooperation; the organization, membership, and operating and financing methods, etc., of the State and county associations; and the volume of business, expenses, income, financial conditions, etc., of associations are discussed and suggestions made for improving the organization, membership, operating and financing methods, etc. The data were obtained largely through the examination of records of the Mississippi Federated Cooperatives (A. A. L.), the State organization, and the 36 affiliated active county associations, and through interviews with county agricultural agents.

Problems and trends in farmers' mutual fire insurance, V. N. VALGREN (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 23 (1938), pp. IV+42, figs. 2*).—This bulletin deals primarily with the problems of management and operation of farmers' mutual fire insurance companies. The historical development and present status of such companies are briefly summarized.

Grade, staple length, and tenderability of cotton in the United States, 1928–29 to 1936–37, W. B. LANHAM. (Coop. 15 expt. stas.). (*U. S. Dept. Agr., Bur. Agr. Econ., 1937, pp. [4]+92, figs. 10*).—This publication carries forward the information published in the series of bulletins previously noted (E. S. R., 77, p. 874). Detailed information is given for the crop year 1936–37 and more general information for the period from 1928–29 to 1936–37.

Grade, staple length, and tenderability of cotton in the United States, 1928–29 to 1937–38, W. B. LANHAM. (Coop. 15 expt. stas.). (*U. S. Dept. Agr., Bur. Agr. Econ., 1938, pp. [4]+91, figs. 10*).—This publication continues the information noted above and covers the crop year 1937–38 and the period from 1928–29 to 1937–38. Data are included for the first time on the grade and staple length of United States ginnings of sea-island cotton.

Grain grading primer, W. P. CARROLL, W. B. COMBS, and F. G. SMITH (*U. S. Dept. Agr., Misc. Pub. 325 (1938), pp. 44, figs. 20*).—"This publication is designed primarily to provide information and instruction for grain farmers, grain dealers, and grain students on why and how grain is graded." The development of grain grading and grade inspection under the U. S. Grain Standards Act are described. Grain-grading factors, apparatus needed for grading, and grain-grading methods are described and discussed. The publication is not designed for grain inspectors who must use precise and detailed grain-grading technic.

Organization of the Louisville wholesale fruit and vegetable market, H. B. PRICE, C. D. PHILLIPS, and S. E. WEATHER. (Coop. Univ. Ky. et al.). (*Kentucky Sta. Bul. 386 (1938), pp. 279–312, figs. 7*).—This bulletin reports the results of an examination of the Louisville market in 1937 and is a continuation of the study previously noted (E. S. R., 77, p. 717). The information was obtained through personal interviews with growers patronizing the market, trucker-merchants hauling produce to and from the market, established dealers in the market, and railroad records of unloads of fruit and vegetables on the market. The importance of Louisville as a fruit and vegetable market, the organization of the market, the business done by wholesale dealers, and the organization, facilities, operation, etc., of the Gardeners' and Farmers' Market are described and discussed. Other sections discuss the need for standardization of containers, grading, and packing in the market, the instability of prices, intercity trucking, and the seasonal use of the market facilities.

Marketing commercial cabbage, R. L. Spangler (*U. S. Dept. Agr., Tech. Bul. 646* (*1938*), *pp. 126, figs. 28*).—Data are included as to acreage, yield, production, types, and varieties of cabbage. The important producing areas and city markets are described. The harvesting; grading; packing; Federal-State inspection; storage; transportation; financing; distribution of shipments by months and markets and by rail, boat, and truck; methods of sales and prices in producing areas; the methods and channels of distribution; and prices in the city markets are described and discussed. Many of the tables show data by years 1927–36; others cover 1 yr. or more during the period 1932–36. The bulletin is based on Department Bulletin 1242 (E. S. R., 51, p. 892).

Livestock auction markets [in Georgia] (*Georgia Sta. Rpt. 1938, pp. 13, 14*).—Some general findings as to legislation, financing, operating practices, charges, etc., in a study made in cooperation with the U. S. Farm Credit Administration are included.

Crops and Markets, [November 1938] (*U. S. Dept. Agr., Crops and Markets, 15* (*1938*), *No. 11, pp. 233–256, figs. 2*).—Included are crop and market reports of the usual types.

RURAL SOCIOLOGY

Soil and civilization, H. J. Harper (*Okla. Acad. Sci. Proc.* [*Okla. Univ.*], *17* (*1937*), *pp. 9–14*).—This contribution was presented as the presidential address at the annual meeting of the Oklahoma Academy of Science held at Stillwater December 5, 1936.

Studies of suburbanization in Connecticut.—II, Norwich: An industrial part-time farming area, N. L. Whetten and R. F. Field ([*Connecticut*] *Storrs Sta. Bul. 226* (*1938*), *pp. 121, figs. 22*).—This report is the second of a series previously noted (E. S. R., 77, p. 270) designed to describe the migration of population into the rural areas immediately surrounding the cities and to indicate some of the social and economic adjustments resulting.

The present investigation is concerned with the rural areas of the town of Norwich surrounding the small manufacturing city of Norwich. The area is characterized as an industrial part-time farming community, there being a number of small manufacturing villages in the town in addition to the industries located in the city. The data were obtained by means of a house to house survey of 925 families during the fall of 1935 and the winter of 1936. Between 1920 and 1930 rural Norwich registered a 27.6 percent increase in population compared with 3.2 percent for Norwich City. The migrants to rural Norwich are predominantly from the unskilled and semiskilled occupational groups, although there was a tendency for the proportion of "white-collar" workers to increase among the more recent migrants. The migration to rural Norwich represents much more of a back-to-the-land movement than was found in the Windsor study. About five out of every six householders farming gave some nonfarming occupational activity as their principal job, and of all those whose principal occupation was not farming, more than two out of five were doing some farming.

There was a net shift toward home ownership, and a shift from multifamily dwellings to single detached family residences. An increase in both the number of rooms per dwelling and in the number of rooms per individual upon moving to the area was noted. The average family in rural Norwich belonged to only 1.7 voluntary social organizations. A large proportion of the families were members of a church, but only a small proportion belonged to other organizations. The Protestants belonged to more organizations than did the Catholics, and the native-born averaged more than the foreign-born.

Washington farm trade centers, 1900–1935, P. H. LANDIS (*Washington Sta. Bul. 360 (1938), pp. 40, figs. 5*).—The number of people living in trade centers with less than 2,500 population has increased during each decade, but the percentage of the total population of the State living in them declined from 22.1 percent in 1900 to 13.3 percent in 1930. Fewer people were living in hamlets in 1930 than in 1900 in spite of a 202 percent increase in the population of the State. During the decade 1920–30, hamlets increased markedly in population and villages with from 250 to 999 population gained somewhat, whereas towns with from 1,000 to 2,499 population lost approximately 6,500 persons. Washington has 45.1 percent of its rural nonfarm population living in the open country, while the United States has 28.9 percent. There were 826 trade centers in the State in 1900, and the climax was reached in 1910, when there were 1,160. By 1935 there were only 973. Growth and decline have been regionalized rather than individualized, with trade centers of the entire Puget Sound area south to the Columbia River tending toward growth and those in the eastern part of the State tending toward decline.

The decade of railroad expansion (1900–10) saw the greatest increase in trade centers, and the following decade of highway expansion when the automobile came into universal use saw the greatest number of trade centers disappear. Since 1900, 461 successful trade centers have succeeded in surviving until 1935. Three-fourths of them still have less than 5 business units. Two, or only 0.5 percent, have exceeded 100 business units. Almost half of the trade centers appearing in the State since 1900 disappeared by 1935 regardless of the decade in which they originated.

The decline of the fourth-class post office was no doubt a factor in the failure of the hamlet, for the rural route made the regular visit of the farm family to the hamlet unnecessary. The parcel post system added to rural routes brought the mail-order house into competition with the farm trade center. The growth of newspaper and radio advertising, the increased circulation of papers, and use of radios in rural homes, combined with the greater freedom of movement have contributed to the drawing power of the metropolis and lessened the dependence of the farm family upon nearby trade centers.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Bacteriology, E. D. and R. E. BUCHANAN (*New York: Macmillan Co., 1938, 4. ed., pp. XV+548, figs. 245*).—In this volume, the first edition of which has been noted previously (E. S. R., 29, p. 298), several chapters have been rewritten and one on the character of the viruses and bacteriophages has been added. The keys to orders, families, and genera of bacteria, yeasts, and molds are contained in the appendixes.

Market milk and related products, H. H. SOMMER (*Madison, Wis.: Author, 1938, pp. XIV+699, figs. 48*).—This text is designed for practical milk plant operators, short course students, academic students, and research workers. It covers the technical phases of the market milk industry. Business and administrative phases of milk plant operation are presented only in brief outline form. The subject is dealt with in chapters on the composition of milk; the healthfulness of milk; safeguarding the milk supply; selecting market milk; sources of contamination and their control; buying and assembling the milk; clarifying or filtering and pasteurizing market milk; bottles, bottle washing, and bottling milk; laboratory control and defects in market milk; coffee cream and whipping cream; special milks; cultured buttermilk and cultured cream; cottage cheese; and methods of distribution. In addition, reference chapters are included on physicochemical fundamentals, the acidity of milk and dairy products, and physical and physicochemical properties of milk. Each chapter is followed by review questions.

Technical journalism, F. W. Beckman, H. R. O'Brien, and B. Converse (*Ames, Iowa: Collegiate Press, Inc., [1937], pp. VIII+339*).—This volume is a revision of the text previously noted (E. S. R., 58, p. 289). Its scope has been broadened to include writing problems of engineering and science students. It represents in large measure not only the experiences of the authors in newspaper and magazine work but also the teaching technics and course contents developed by them at the Iowa State Colege.

Organization of 4-H club work: A guide for local leaders, G. L. Warren (*U. S. Dept. Agr., Misc. Pub. 320 (1938), pp. [2]+35, figs. 18*).—This manual "has been prepared with special reference to the development of the character-building phase in relation to the essentials of the 4-H Club program." The organization of 4-H Club work is dealt with under the headings of distinguishing features of 4-H Club work, general organization, the local volunteer leader, basic principles of procedure in program making, development of social ideals, development of leadership within the group, and general 4-H Club activities, and character-building methods in such work are summarized.

FOODS—HUMAN NUTRITION

[Proceedings of the Food Technology Conference] (*Food Res., 3 (1938), No. 1–2, pp. 281, figs. 29*).—Among the papers presented at the Food Technology Conference held at the Massachusetts Institute of Technology September 7–10, 1937, the following, together with several abstracted below, are of particular interest: Advancement in Sterilization Methods for Canned Foods, by C. O. Ball (pp. 13–55); Action of Enzymes at Low Temperatures, by A. K. Balls and H. Lineweaver (pp. 57–67) (U. S. D. A.); Recent Developments in Canning Technology with Reference to Spoilage Control, by E. J. Cameron (pp. 91–99); Spectroscopy in Food Research, by G. R. Harrison (pp. 121–125); Microbiology in Relation to Food Preservation, by S. C. Prescott and F. W. Tanner (pp. 189–197 (coop. Univ. Ill.); and Utilization of Whey in Foods, by B. H. Webb (pp. 233–238) (U. S. D. A.).

Report of the Chief of the Food and Drug Administration, 1938, W. G. Campbell (*U. S. Dept. Agr., Food and Drug Admin. Rpt., 1938, pp. 24*).—This annual report (E. S. R., 78, p. 719) contains a brief statement of the features of the Food, Drug, and Cosmetic Act of June 25, 1938, which replaces the Food and Drug Act of 1906, followed by the customary enforcement statistics and summaries for the year on the detection of food adulteration involving filth and decomposition, and economic cheats; seizure of canned foods under the McNary-Mapes amendment; inspection services for shrimps under the sea food amendment; actions on drugs, including the products known as Elixir Sulfanilamide and Rex 152; bacteriological, vitamin, and pharmacological studies; development of new analytical methods; and comments on court cases. Progress reports are also included on the year's work under the Insecticide, Caustic Poison, Import Milk, Tea, Filled Milk, and Naval Stores Acts; certification of coal-tar colors; and collaboration with and service for other governmental agencies.

Foods and drugs, E. R. Tobey (*Maine Sta. Off. Insp. 167 (1938), pp. 139–182*).—This annual report, like the preceding one (E. S. R., 77, p. 725), consists chiefly of the results of analyses of oils used in packing sardines. Of the 109 samples tested, only 1, a brand of olive oil, contained free fatty acids in excess of 0.25 percent, the maximum percentage allowed by law. The report also contains a statement, submitted by A. M. G. Soule, of the laws regulating the manufacture, sale, distribution or transportation of drugs and foods in the State.

[Food and nutrition studies by the Georgia Station] (*Georgia Sta. Rpt. 1938, pp. 71, 72, 85–88, figs. 2*).—This progress report includes brief summaries of an extension of previous work on dark adaptation in school children (E. S. R., 78, p. 719) and of studies of the available iron as determined biologically of various seed vegetables, of the available iron and calcium in pasture plants subjected to different fertilizer treatments, and of factors affecting the ascorbic acid content of certain vegetable foods.

A section on work with frozen foods includes a list of farm products which may advantageously be frozen, a discussion of improved methods of distribution of frozen foods, and a brief summary of recent microscopic studies of frozen fruits and vegetables noted on page 443 from the complete report.

Effect of cut, grade, and class upon palatability and composition of beef roasts, M. Satorius and A. M. Child (*Minnesota Sta. Tech. Bul. 131 (1938), pp. 16, figs. 4*).—The longissimus dorsi (eleventh-twelfth rib roast), triceps brachii (bread and butter cut), and adductor (round) muscles from six steers graded "high-medium to good" and seven cows graded "good" were cooked and compared for press fluid, shear force, diameter and number per bundle of muscle cells, cooking losses and composition, and judges' scores. The meat had been ripened for 11 days at 2°–3° C. The methods recommended by the cooking committee of the Cooperative Meat Investigations were followed in cooking the samples to 58° at 150°. The pressometer was used in determining the press fluid, the shear-force apparatus for the shear force, and in the chemical analysis the total moisture and ether extract were determined. The subjective judging was done by a panel of four or five judges, using the grading sheet of the Cooperative Meat Investigations and comparing the grades on the raw meat and on the external appearance of the cooked roasts by a score card devised by the authors.

No differences were found in the press fluid content of the three muscles or between the triceps brachii and longissimus dorsi muscles in shear force, diameter of muscle fibers, and total judges' score. The adductor muscle contained smaller bundles of larger muscle fibers, required more pounds of shear force, and ranked lower in palatability. The cooking losses were highest and the ether extract material lowest in the adductor muscle, followed by the triceps brachii and longissimus dorsi muscles. The total moisture content was highest in the triceps brachii and lowest in the longissimus dorsi muscle. While the press fluid did not differ between the cows and steers, the shear force was lower, the muscle fiber diameter smaller with less fibers per bundle, the total moisture content lower, the ether extract higher, and the total cooking losses were greater in the cows than in the steers. The judges rated the cows lower in palatability, particularly in flavor-aroma. No differences were found in press fluid, shear force of raw and cooked samples, total cooking losses, total judges' scores or scores for the appearance of the cooked roasts of adductor and longissimus dorsi muscles from medium and good grades of heifer. The longissimus dorsi muscle of the medium grade contained more total moisture and less ether extract material than that from the good grade.

Basal metabolism, radiation, convection and vaporization at temperatures of 22 to 35° C., J. D. Hardy and E. F. Du Bois (*Jour. Nutr., 15 (1938), No. 5, pp. 477–497, figs. 6*).—Following the method described in the paper noted above, the authors with the technical assistance of G. F. Soderstrom, conducted tests on two nude subjects under basal conditions in the respiration calorimeter at environmental temperatures between 22° and 35° C. (71.6° to 95° F.), and determined the heat lost in vaporization and the radiation of heat to calculate the normal convection loss.

At temperatures between 22° and 26° the heat eliminated gradually exceeded the heat produced and radiation accounted for about 70 percent of the total loss. As the skin and air temperatures approached each other, the heat loss by radiation gradually decreased to 0. At the lower temperatures the heat lost by vaporization amounted to about 18–30 percent and at 35° to almost 100 percent. The heat loss by convection remained at about 15 percent at temperatures up to 32°. At the higher temperatures the heat loss was taken care of by continuous sweating through the entire period. At the lower temperatures the skin cooled rapidly for 90 min. and eventually the subjects had chilly sensations, with an involuntary tensing of the muscles, followed by a violent chill. Throughout the entire range of temperatures the basal metabolism of both subjects remained at about the same level, with only a slight rise a few minutes before a chill occurred.

The technic of measuring radiation and convection, J. D. Hardy and E. F. Du Bois (*Jour. Nutr., 15 (1938), No. 5, pp. 461–475, fig. 1*).—A method is described for studying the convection loss by determining the radiation of heat from the surface of the body with a radiometer and the heat lost by vaporization in a respiration calorimeter. The heat stored within the body is calculated from the difference in heat production and heat loss. The authors had the technical assistance of G. F. Soderstrom.

A method of diet analysis: Application in research and pediatric practice, B. S. Burke and H. C. Stuart (*Jour. Ped., 12 (1938), No. 4, pp. 493–503*).—The method described has been developed at the Center for Research in Child Health and Development of the Harvard School of Public Health during the past 6 yr. and consists of obtaining a complete history from the mother regarding her diet during pregnancy and the infant's diet from birth. The dietary histories are evaluated by the nutritionist on the basis of content of carbohydrate, fat, protein, calcium, phosphorus, iron, and the vitamins, and a five-point rating scale is applied. The method has been used to study the nutritional differences between children and between pregnant women, and a correlation has been demonstrated between the dietary ratings and the objective measures of various nutritional states.

The effect of urea on the human respiratory exchange and alveolar carbon dioxide, T. M. Carpenter (*Jour. Nutr., 15 (1938), No. 5, pp. 499–512*).—The respiratory exchange of an adult was determined, using an open circuit apparatus with a mouthpiece and another with a helmet, in test 1 with no ingestion, test 2 after 400 and 500 cc of water, and tests 3 and 4 when 30 and 40 g of urea, respectively, were added to the doses of water. The alveolar carbon dioxide was determined on samples collected every 7 or 8 min., and total nitrogen, urea, and ammonia determinations were made on samples of urine. The ingestion of urea did not affect the metabolic rate, but a marked rise in alveolar carbon dioxide occurred during the 2-2½ hr. following the ingestion, and the respiratory quotient rose significantly from the beginning of the first to the end of the third hour. About 30 percent of the ingested urea was eliminated within 3 or 4 hr., the maximum elimination occurring during the period when the alveolar carbon dioxide was raised.

Undernutrition and carbohydrate metabolism, W. H. CHAMBERS (*Physiol. Rev., 18 (1938), No. 2, pp. 248–296*).—In this extensive review, which has over 200 references to the literature, the author presents evidence in support of the theory that the two most important factors influencing carbohydrate utilization are the amount of carbohydrate available to the cells and the endocrine control.

Utilization of organic and inorganic iron by the normal infant, H. OLDHAM, F. W. SCHLUTZ, and M. MORSE (*Amer. Jour. Diseases Children, 54 (1937), No. 2, pp. 252–264, fig. 1*).—In continuation of a previous investigation (E. S. R., 70, p. 721), the authors studied the iron metabolism for 28 5-day periods of a normal 6-month-old infant receiving a diet of powdered milk, cane sugar, orange juice, cod-liver oil, cereal, and spinach or peas, with beef and Celu-flour added during the latter part of the study. During some periods cupric sulfate and soluble ferric pyrophosphate supplements were administered. The total iron content of the food and excreta was determined by a modification of the Stugart method, and the inorganic iron by modifications of the α,α'-dipyridine method (E. S. R., 64, p. 712). Hemoglobin was determined weekly by the Newcomer method.

The amount of iron retained varied from 0.19 mg when the total iron intake was 2.7 mg, with an inorganic iron content of 2.2 mg, to 0.86 mg when the total intake was 5.2 mg and the inorganic content 4.93 mg. Almost 80 percent of the hemoglobin values were between 9.7 and 10.7 g per 100 cc of blood, with only slightly higher values during periods of higher iron intake. It is concluded that the results do not show that only inorganic iron can be utilized by the body. In this study the availability of the iron in the food could not be determined by its reaction to α,α'-dipyridine.

Tables of the vitamin content of human and animal foods, compiled by M. A. BOAS FIXSEN and M. H. ROSCOE (*Imp. Bur. Anim. Nutr. [Aberdeen], Nutr. Abs. and Rev., 7 (1938), No. 4, pp. 823–867*).—The values in these tables are limited to results published since 1931 when international standards and units were first instituted. Those based upon results of biological tests are limited, with a few exceptions in the tables on vitamin B_1 and D, to data based on direct simultaneous comparisons with the international standards themselves or with some other previously standardized stable substance.

The foods for which data are reported are classified by food groups under the main headings vegetable products, animal products, and miscellaneous. The data for vitamin A are given in three tables consisting of substances containing vitamin A without carotenoids, carotenoids without vitamin A, and both vitamin A and carotenoids. Of the B vitamins, only B_1 and B_2 (ribo- or lactoflavin) are considered. The data are arranged as minimum and maximum figures reported in each study included, numbered references to which are given in the same order. Where a series of values is given, the minimum and maximum of the entire series are distinguished by bold-faced type from the intermediate values. The bibliography comprises 257 references.

The vitamin content of human foods as affected by processes of cooking and canning (with tables), M. A. BOAS FIXSEN (*Imp. Bur. Anim. Nutr. [Aberdeen], Nutr. Abs. and Rev., 8 (1938)), No. 2, pp. 281–307*).—This report is designed to supplement the one noted above. The plan followed consists in first considering the principal processes used in preparing cooked foods and then reviewing the effects which such treatments have been found to have on each of the vitamins A, B_1, B_2 complex, C, and D. This discussion is followed by tables giving the reported value for the raw and corresponding cooked material, with the method of treatment, and literature references. It is emphasized, however, that the actual values as thus reported should not be used to calculate the vitamin content of a diet containing cooked materials, but only in suggesting allowances that should be made. Actual calculations should be based upon the vitamin content of the raw materials, with due allowance for losses occurring during the heat treatment. The bibliography comprises 156 references.

The ascorbic acid content of fruits and vegetables, M. Olliver (*Analyst, 63 (1938), No. 742, pp. 2–17, figs. 8*).—Using the Harris and Ray modification (E. S. R., 73, p. 427) of the Tillmans titration method and adding metaphosphoric acid to prevent oxidation during extraction, the ascorbic acid content of six varieties of black currants, two of gooseberries, five of strawberries, three of peas, and one of potatoes and of asparagus was determined. The effect of factors such as the degree of maturity, date of picking, size of the individual fruit, and the distribution of ascorbic acid in different parts of the fruit and vegetable and the content in the 1936 and 1937 crops were studied. The values obtained are contained in the vitamin tables reported by Boas-Fixsen above.

ABC of the vitamins: A survey in charts, J. Gregory (*Baltimore: Williams & Wilkins Co., 1938, pp. XII+93, [figs.] 56*).—The story of the vitamins is presented by means of charts and graphs. The book contains a foreword by W. H. Eddy, a list of about 75 literature references, and an extensive glossary of terms.

Vitamin A research and its clinical applications in pediatrics, A. M. Yudkin (*Jour. Ped., 12 (1938), No. 6, pp. 701–715*).—The author reviews the relationship between vitamin A and carotene, the stability of the vitamin, the unitage assigned by the International Conference, the function of vitamin A in the body and the effect of a deficiency, and the prevention of vitamin A deficiency in different parts of the world. Clinical and laboratory observations are interpreted, and prophylactic and therapeutic measures to prevent vitamin A deficiency are discussed. The bibliography lists 42 references.

The variation of the extinction coefficient of vitamin A with solvent, A. E. Gillam and M. S. El Ridi (*Biochem. Jour., 32 (1938), No. 5, pp. 820–825*).—The relative intensities of light absorption of a number of purified vitamin A concentrates from halibut-liver oil were determined in the solvents ethyl alcohol, light petroleum, benzene, and chloroform with a Hilger quartz spectrograph and a Spekker photometer. Determinations were also made on 18 butters of different origin and vitamin A content.

Taking the average value of the extinction coefficient $E_{1\ \mathrm{cm}}^{1\ \mathrm{percent}}$ relativ to alcohol as 1,600, the average values found for the other solvents were 1,450 for light petroleum and 1,330 for benzene and chloroform. The ratio of the extinction coefficients for alcohol and chloroform, 1,600 : 1,330, was the same when determined on the unsaponifiable matter of the test oil. In the presence of the fatty components of the liver oils the extinction coefficient in chloroform was closer to that in alcohol solution, but the ratio varied with different oils. On the basis of $E=1{,}600$ for pure vitamin A in alcohol, the average value for the extinction coefficient obtained was 1,400 for all the butterfat samples and 1,600 for the colostrum and particularly rich butter, and relative to chloroform the value 1,350 was obtained for both groups of butter samples.

A physico-chemical and biochemical study of vitamin A_2, E. Lederer and F. H. Rathmann (*Biochem. Jour., 32 (1938), No. 7, pp. 1252–1261, fig. 1*).—In continuation of previous studies (E. S. R., 79, p. 440), the authors present further data on the relative quantities of vitamins A_2 and A_1 (A) contained in marine and fresh-water fish oils and in other animals. In addition the absorption of vitamin A_2 from the intestine and its accumulation in the liver of the sheep, chicken, rat, and frog were studied.

The relative intensities of absorption of the richest vitamin A_2 concentrate tested were $E^{1\ \text{percent}}_{1\ \text{cm}}$ 695 mμ : $E^{1\ \text{percent}}_{1\ \text{cm}}$ 650 mμ : $E^{1\ \text{percent}}_{1\ \text{cm}}$ 620 mμ = 3 : 1.8 : 1. With the ratio $E^{1\ \text{percent}}_{1\ \text{cm}}$ 620 mμ : $E^{1\ \text{percent}}_{1\ \text{cm}}$ 650 mμ for pure vitamin A_2 placed at 0.25, it would appear that approximately half of the absorption at 620 mμ (1.8 times 0.25 = 0.45) should be attributed to the vitamin A_2 and, therefore, for pure vitamin A_2 the value of the ratio $E^{1\ \text{percent}}_{1\ \text{cm}}$ 695 mμ : $E^{1\ \text{percent}}_{1\ \text{cm}}$ 620 mμ must be between 6 and 8. Taking 7 as an average value, the relative quantities of vitamins A_2 and A present in a sample may be calculated by the formula

$$\text{vitamin } A_2 : \text{vitamin } A_1 = E\ 695\ \text{m}\mu : \left(E\ 620\ \text{m}\mu - \frac{E\ 695\ \text{m}\mu}{7}\right).$$

Evidence is presented to show that vitamin A_2 is absorbed from the intestine and is accumulated in the liver of the rat and the frog. Confirming the findings of Edisbury et al. (E. S. R., 79, p. 710), the absence of vitamin A_2 from the liver of the sheep and chicken is attributed to the diet of these animals, which is lacking in vitamin A_2.

Studies in the stability of vitamins A and D, I, F. A. Robinson (*Biochem. Jour., 32 (1938), No. 5, pp. 807–814, fig. 1*).—Following absorption of oxygen by the unsaponifiable fraction of vitamin A-rich oil for 5½ hr., the oxidized material was examined spectrophotometrically. The value of the extinction coefficient $E^{1\ \text{percent}}_{1\ \text{cm}}$ 328 mμ had decreased from 700 to 100. When the concentrate was mixed with bile salts before oxygen uptake, the vitamin A was completely protected from oxidation and the value of the extinction coefficient fell only from 700 to 610 after 4 hr. at 100° [C]. Oxidation of the vitamin A concentrate resulted in loss of hydrogen, decrease in hydroxyl, and increase in amounts of ester aldehyde and ketone and in the molecular weight, accompanied by an increasing degree of saturation.

By bio-assay it was found that the biological activity decreased progressively but not at the same rate with the value of $E^{1\ \text{percent}}_{1\ \text{cm}}$ 328 mμ and the Carr-Price value. The following factors were determined for converting the extinction coefficient value of the concentrate and three oxidation products into International Units: 1,060, 950, 650, and 190, respectively, which are considerably below the 1,600 factor. For conversion of Carr-Price values into International Units, the values obtained were 21.5, 22.5, 20.5, and 10, respectively, which are below the factor 31. The presence of oxidized vitamin A in the concentrate, which is also present in stale fish-liver oils, is believed to be responsible for the reduced value of both factors. "Until some method can be found of correcting for this irrelevant absorption and chromogenic activity, the results obtained for the vitamin A content of oils and concentrates must be accepted with reserve and should be supported, when necessary, by biological assays."

Vitamin B_1: Methods of assay and food sources, H. E. Munsell (*Jour. Amer. Med. Assoc., 111 (1938), No. 10, pp. 927–934*).—This paper presents a discussion of the methods of assay for vitamin B_1 and the quantitative interpretation of the results and evaluates the food sources of the vitamin. The bibliography lists about 70 references to the literature.

Report of the Vitamin Assay Committee, A. D. Holmes et al. (*Amer. Drug Mfrs. Assoc. Proc., 27 (1938), pp. 225–231*).—The work done by the committee in cooperation with the U. S. P. Revision Committee on the rat curative method for vitamin B_1 and the rat and chick curative methods for flavin is reviewed.

Vitamin B_1 assay by a rat-curative procedure, O. L. Kline, C. D. Tolle, and E. M. Nelson. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 2, pp. 305–313, fig. 1*).—The Smith method (E. S. R., 63, p. 291) has been modified for use in assaying materials low in vitamin B_1. The modified basal diet consists of sucrose 61 percent, purified casein 18, salts No. 1 4, cod-liver oil 2, autoclaved yeast 4, autoclaved peanuts 10, and purified liver extract 0.75 percent. The procedure consists in standardizing the animal by determining the period of curative response for 2 International Units of vitamin B_1 and then testing the unknown material upon the second occurrence of acute polyneuritis in the same animal. To determine the exact potency of an unknown, the material is fed at different levels to find the approximate quantity containing 2 I. U. and the assay is then made on groups of at least eight animals by successive feedings of standard and unknown. Since the administration of 2 I. U. of vitamin B_1 cured and prevented the recurrence of polyneuritis for a period of from 7 to 11 days in 40–50 g rats maintained on the basal diet, the length of the period of curative response in test rats which exhibited a complete cure is taken as the criterion of the amount of vitamin B_1 contained in the test material.

Studies on the vitamin B_1 requirements of growing rats, A. Arnold and C. A. Elvehjem. (Wis. Expt. Sta.). (*Jour. Nutr., 15 (1938), No. 5, pp. 429–443, figs. 2*).—Since the autoclaved grain ration 240A developed by Kline et al. (E. S. R., 69, p. 844) for tests with chicks was found to be unsuitable for studies on vitamin B_1 with rats unless greatly modified, a synthetic vitamin B_1-low ration 112 was developed. The new ration has the following composition: Sucrose 62 parts, purified casein 18, autoclaved peanuts 10, autoclaved yeast 10, and salts No. 1 4 parts supplemented by factor W $\cong$ 2 liver extract and 2 drops twice weekly of halibut-liver oil. The heat-stable components of the vitamin B complex are supplied by the autoclaved yeast and vitamin B_4 and unsaturated fatty acids by the peanuts. The inclusion of factor W in the ration markedly reduced the vitamin B_1 requirements of the test rats. The control rats receiving the ration supplemented with 80 and 100 μg of vitamin B_1 hydrochloride per 100 g of ration grew at an average daily rate of 3.2 and 3.6 g, respectively, during a 5-week test period. The authors point out that as yet the method is not sufficiently developed for assay purposes.

The effect of varied vitamin B ingestion upon the appetite of children, F. W. Schlutz and E. M. Knott (*Jour. Nutr., 15 (1938), No. 5, pp. 411–427, figs. 2*).—In continuation of previous studies (E. S. R., 78, p. 427), the authors, with the cooperation of N. I. Stage and M. L. Reymert, kept food consumption, growth, and health records for 32 weeks for 32 children aged 4–10 yr. and for 22 girls aged 9–11 yr. During the first three test periods, which served as a control period for the remainder of the investigation, the younger children were divided into three groups and received at breakfast 15 g of a refined wheat cereal or of a whole wheat cereal, with and without 3.3 g of a wheat germ preparation, the groups being rotated so that each group received each of the three different cereals. During the fourth period the children had free choice of as much breakfast cereal as they desired and received in addition 5 g of the wheat germ preparation and in the fifth and sixth periods 455 g of crystalline vitamin B daily. The older girls were deprived of vitamin B supplement during the first three periods and received the wheat germ in the fourth to sixth periods, the seventh was another control period, and the crystalline vitamin B was given in the eighth period. The vitamin B content of the diet and supplement was determined by biological assay.

The average vitamin B intake ranged from 260 to 420 International Units when the subjects were receiving the diet unsupplemented and from 380 to 620 I. U. when the supplements were added. The protein intake ranged from 2.13 to 2.51 g and averaged 2.27 g per kilogram of body weight. For the smaller children the daily food consumption averaged 1,599 g during the control period, 2,003 in period 4, and 1,961 g in periods 5 and 6. The older girls averaged 1,791 g during periods 1 to 3, 2,089 in periods 4 to 6, 1,873 in period 7, and 2,116 g in period 8. On the basis of the data for the older girls, a direct relationship was not demonstrated between the total food consumption and the gain in weight in all cases, since an increase in amount of food eaten did not always mean an increase in caloric consumption. The older girls had an average monthly weight gain of 0.3 kg during the control periods, 0.5 when receiving wheat germ, and 0.8 kg when receiving crystalline vitamin B. A slight correlation was demonstrated between age and gain in weight, with the oldest girls showing the greatest weight gains. It appears that the higher vitamin B intake did not force the growth nor produce any apparent ill effects, but it did tend to stabilize the appetite of the children.

The effects of life-long subsistence on diets providing suboptimal amounts of the "vitamin B complex," J. C. Drummond, A. Z. Baker, M. D. Wright, P. M. Marrian, and E. M. Singer (*Jour. Hyg.* [*London*], *38* (*1938*), *No. 3, pp. 356–373, figs. 4*).—The growth, appearance, state of health, and breeding performance of one group of rats maintained on an adequate diet and another group receiving a suboptimal amount of the vitamin B complex were compared. For the most part the rats were kept on experiment until they died from natural causes, when post-mortem examinations were made. The rats on the vitamin B complex-deficient diet showed no evidences of increased susceptibility to tumors and cancerous developments or to bronchiectasis, but had a significantly greater incidence of gastrointestinal lesions, particularly ulcerations, a poorer breeding record, and a definite shortening of the life span.

The effect of experimental hyperthyroidism on the vitamin B_1 content of some rat tissues, V. A. Drill (*Amer. Jour. Physiol.*, *122* (*1938*), *No. 2, pp. 486–490*).—Using the Schultz et al. method (E. S. R., 79, p. 11), the authors determined the vitamin B_1 content of the tissues of normal and hyperthyroid rats maintained on diet No. 3, which consists of cornstarch 59 parts, casein 20, Crisco 10, yeast 5, salts 4, and cod-liver oil 2 parts, supplemented by 100 mg of desiccated thyroid. The food intake was restricted to 12 g per day. After 9 days on the test diet some of the animals were given 500γ of vitamin B_1 by daily injection.

The normal rats receiving thyroid showed a normal vitamin B_1 content in the spleen and decreased contents in the kidneys and liver as compared with normal rats on the test diet without thyroid. The vitamin B_1 content of the livers of hyperthyroid rats receiving crystalline vitamin B_1 was approximately one-third lower than in the livers of normal rats receiving the vitamin supplement, and the former group showed a normal content of vitamin B_1 in the spleen and muscles, decreased content in the kidneys and liver, and slightly increased content in the heart.

Lactoflavin (riboflavin) increases hemoglobin production in the anemic dog, P. György, F. S. Robscheit-Robbins, and G. H. Whipple (*Amer. Jour. Physiol.*, *122* (*1938*), *No. 1, pp. 154–159*).—In continuation of previous studies (E. S. R., 78, p. 574), the authors conducted five experiments on four anemic dogs receiving from 1.7 to 10 mg of lactoflavin per day as supplement to the anemia-producing ration, which has a calculated content of from 0.8 to 1.5 mg of lactoflavin in the amounts fed per day. The average response to the lactoflavin was the regeneration of 28 g of hemoglobin in 2 weeks, which is about one-half the response shown by a control dog receiving 40 mg of iron per day and about one-fourth the response to the standard 300-g dose of liver which contains about 30 mg of lactaflavin.

Effect of vitamin B_1 on the iron retention of a normal infant, F. W. Schlutz, H. Oldham, and M. Morse (*Amer. Jour. Diseases Children, 56 (1938), No. 4, pp. 735–743, figs. 2*).—In continuation of the study noted on page 559, the authors investigated the influence of vitamin B_1 on the iron metabolism of a normal 7-month-old infant for 8 mo., during which time the amount of iron retained in 6 6-day periods and 25 3-day periods was determined. The calcium retention was studied during the first 6 periods. The vitamin B_1 content of the diet was approximately 10 International Units per kilogram of body weight per day and was supplemented by varying amounts of the vitamin during some of the periods. Cupric sulfate in amounts furnishing 0.1 mg of copper per kilogram of body weight was administered, and the supplementary iron intake in the form of ferric pyrophosphate brought the total iron intake up to 0.48 mg in periods 1–3, 0.42 in 4–6, 0.82 in 7–16, 1.08 in 17–21, 1.32 in 22–26, and 1.23 mg per kilogram of body weight in periods 27–31.

The average amounts of iron retained were +0.02 mg in periods 1–3, −0.012 in 4–6 when the infant received 90 units of the vitamin B_1 supplement, +0.046 in 7–11, −0.001 in 12–16 and +0.019 in 17–21 when the infant received 108 units of the vitamin B_1 supplement, +0.3 in 22–26 and +0.018 in periods 27–31 when the infant received 126 units of the vitamin B_1 supplement. The hemoglobin content remained in the high normal range of from 12 to 14 g per 100 cc during the study. In general the variations in the retention of iron were correlated with the amount of food consumed rather than with the iron intake. The results indicate that the high vitamin B_1 intake tended to have an unfavorable influence on the iron balance of the subject studied.

In periods 1–3 the infant retained +34.1 mg of calcium when the calcium intake averaged 147 mg, and in periods 4–6 it was +32.4 mg when the intake averaged 137 mg per kilogram of body weight, indicating that the addition of 90 units of the vitamin B_1 supplement did not affect the calcium retention.

Stomatitis of vitamin-B_2 deficiency treated with nicotinic acid, P. Manson-Bahr and O. N. Ransford (*Lancet [London], 1938, II, No. 8, pp. 426–428*).—The oral administration of 150 mg daily of nicotinic acid as supplement to a well-balanced diet to a woman with a history of stomatitis and diarrhea over a 5-yr. period resulted in rapid recovery. Symptoms of intolerance to the nicotinic acid were noted after 10 days of treatment and the daily dose was reduced to 50 mg, and intolerance again occurred after 14 days when the treatment was discontinued because the patient had completely recovered.

Intraspinal (subarachnoid) injection of vitamins B_1 and C in acute poliomyelitis, E. L. Stern (*Clin. Med. and Surg., 45 (1938), No. 3, pp. 108, 109*).—The author recommends the intraspinal injection into the subarachnoid space by way of an ordinary lumbar tap of 10 mg vitamin B_1 and 100 mg of vitamin C immediately upon the development of the earliest symptoms of poliomyelitis. The injection should be repeated every third day for children under 10 yr., and for older children the amounts should be doubled. The treatment is contraindicated if the blood pH is reduced to 6.8 or less. The vitamins should also be administered orally or by parenteral injection as a prophylactic protection during epidemics and in cases of exposure to poliomyelitis and other virus diseases. The case history is reported of a 4-year-old child with poliomyelitis who showed definite improvement on this treatment.

A quantitative and specific method for the titration of ascorbic acid in the urine and the determination of its threshold value [trans. title], H. LUND (*Klin. Wchnschr., 16 (1937), No. 31, pp. 1085–1087, fig. 1*).—The method of determining ascorbic acid in blood serum (E. S. R., 79, p. 151) has been applied to urine, with modifications necessitated by the presence in urine of nonspecific substances which either reduce methylene blue or prevent its reaction with ascorbic acid.

In the presence of a buffer solution of KH_2PO_4, a small amount of sodium chloride, and an alcoholic solution of methylene blue, ascorbic acid added to the urine could be quantitatively recovered, but urine alone gave no reaction. Simultaneous determinations of blood and urine of three healthy subjects after test doses are reported. In the first case ascorbic acid was detected in the urine after 4 hr. The concentration was very low, 1 mg per 100 cc of urine, and decreased still further after 2 hr. At this point the concentration in the blood serum was between 1 and 1.1 mg per 100 cc. In the other two cases there was marked excretion in the urine, beginning in one case when the concentration in the serum was between 1 and 1.2 and in the other between 0.75 and 0.9 mg per cubic centimeter.

It is concluded that the excretion of ascorbic acid in urine depends solely on its content in the blood and that the threshold varies with the individual. Consequently it is thought that the serum titer of ascorbic acid is the only reliable criterion of vitamin C nutrition.

Intradermal dye test for vitamin C deficiency, H. G. PONCHER and C. H. STUBENRAUCH, JR. (Univ. Ill. et al.). (*Jour. Amer. Med. Assoc., 111 (1938), No. 4, pp. 302–304, fig. 1*).—Vitamin C deficiency tests made on 26 persons with a normal blood content of cevitamic acid between 0.8 and 1.8 mg per 100 cc, 9 with a subnormal content between 0.5 and 0.7 mg, and 6 persons with clinically manifest scurvy and blood cevitamic acid content between 0.15 and 0.45 mg per 100 cc did not confirm the results obtained by Rotter (E. S. R., 78, p. 571) and by Portnoy and Wilkinson (E. S. R., 79, p. 570) with the same test procedure. The average decolorization time was about 8 min. for the normal group, 9½ for the subnormal, and 5¾ min. for the scurvy group. It is concluded that the intradermal dye test cannot be relied upon to give satisfactory clinical information regarding the cevitamic acid saturation in the individual case.

[A vitamin C study of South African oranges], I, II, P. J. HAMERSMA (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul. 163 (1938), pp. 53*).—This study is presented in two parts.

I. *The vitamin-C content of South African oranges and its stability over storage periods, some exceeding three months, at approximately 38° F.* (pp. 5–41).—Vitamin C determinations were made on approximately 5,000 oranges of eight different varieties stored at 38°, using the Birch et al. modification (E. S. R., 70, p. 741) of the indophenol titration method and standardizing the indicator against lemon juice with N/100 iodine. Duplicate determinations were made with the iodine titration method. The acidity was determined with N/10 sodium hydroxide, with phenolphthalein as indicator. The average vitamin C content per cubic centimeter of two varieties of Valencia and one of seedling oranges of the 1934 crop varied from 0.56 to 0.71 mg, and of three varieties of Valencia, two of navel, and one of seedlings of the 1934 crop from 0.5 to 0.72 mg. Except for the seedlings, which had an increased content of vitamin C, the storage had no significant effect on the vitamin content. No relationship was demonstrated between the acid content and the stability of the vitamin C, although it was found that seedlings with a vitamin C content higher than that of navels and Valencias also had a higher acid content.

II. *Loss of weight of navels as result of storage periods between 2 to 12 weeks in relation to peel and juice and the effect on the vitamin-C content. Differences between two halves of navels, influence of origin, season, and acidity on vitamin-C stability and content* (pp. 42–53).—The vitamin C and acidity determinations were made separately on the navel and stem halves of one variety of navel oranges obtained from five different orchards, and the effects of factors such as type of soil, climate, fertilizer treatment, and time of picking were studied. The loss in weight of the oranges stored from 0 to 12 weeks at 38° was largely in the juice and averaged about 4.2 g, while the vitamin C content of the oranges remained unchanged. No differences were found in the vitamin C and the acid contents of the navel and stem halves. While the variation between oranges of different pickings was very low, a significant difference was demonstrated in the vitamin C content of oranges of the same species from different trees in the same orchard and an even greater difference between oranges from different orchards. The vitamin C values obtained by the two titration methods were very similar.

Observations on the system ascorbic acid-glutathione-ascorbic acid oxidase, Z. I. Kertesz. (N. Y. State Expt. Sta.). (*Biochem. Jour., 32 (1938), No. 3, pp. 621–625, figs. 5*).—Following essentially the method described by Hopkins and Morgan (E. S. R., 77, p. 152), the author reports that the addition of glutathione to solutions of cucumber and cauliflower juice at pH 6.0 had no effect on the oxidation of the ascorbic acid. It is suggested that the failure to repeat the findings of Hopkins and Morgan may be due to the absence of a factor in the vegetable juices capable of catalyzing the reduction of the dehydroascorbic acid by the glutathione.

Vitamin C deficiency in peptic ulceration and haematemesis, B. Portnoy and J. F. Wilkinson (*Brit. Med. Jour., No. 4027 (1938), pp. 554–560, figs. 5*).—This report is of particular interest in the comparison it affords of six methods of determining vitamin C deficiency in the same four groups of subjects, including a control group of 26 normal subjects on presumably excellent diets, 25 miscellaneous patients (excluding those with gastric or renal disease) on standard hospital diets, 25 patients suffering from proved peptic ulcer without hematemesis, and 31 patients with severe hematemesis attributed to peptic ulceration. The last two groups were on a special ulcer diet.

The methods tested included (1) the urinary excretion of ascorbic acid as determined by the method of Harris, Ray, and Ward (E. S. R., 72, p. 568), with a standard of 13 mg in 24 hr. as the minimal normal value; (2) the ascorbic acid saturation test by a modification of the technic of Abbasy et al. (E. S. R., 74, p. 888); (3) plasma ascorbic acid determinations by the method of Pijoan and Klemperer, with values between 0.66 and 2 mg as normal; (4) the oral ascorbic acid tolerance test in which the ascorbic acid content of the blood is determined at hourly intervals for 5 hr. and of the urine at the same intervals and occasionally through the rest of the 24-hr. period following a single test dose of 1,000 mg ascorbic acid administered orally; (5) the intravenous ascorbic acid tolerance test which differs from the oral only in that the test dose is given intravenously and the blood sampling is begun from 15 to 20 min. after the injection and followed at hourly intervals; and (6) the intradermal test of Rotter (E. S. R., 78, p. 571).

While there was some overlapping in the values from group to group, in general higher and more comparable values in the various tests were obtained with the first two than the last two groups. The saturation test is considered to be more accurate than the estimation of daily ascorbic acid excretion, determinations of the ascorbic acid in the plasma still more reliable, and the urinary response to intravenous doses probably the most reliable of all the methods tested. It is suggested that in this method when used for routine purposes the blood tests may be omitted and determinations made only of the ascorbic excretion in the urine during the first 5 hr. after the injection. It is noted, however, that this test may not be valid in cases of renal impairment.

The chemistry of vitamin E, I–III (*Science, 88 (1938), No. 2271, pp. 37–40*).—Three papers are presented.

I. *The structure and synthesis of α-tocopherol*, L. I. Smith, H. E. Ungnade, and W. W. Prichard. (Univ. Minn.). (pp. 37, 38).—Evidence is presented to indicate that α-tocopherol is a chromane with two substituents in the α-position.

II. *Biological assays of various synthetic compounds*, H. M. Evans and G. A. and O. H. Emerson (Univ. Calif.). (pp. 38, 39).—In continuation of previous studies (E. S. R., 79, p. 152), the authors conducted a series of feeding tests with rats to determine the vitamin E activity of durohydroquinone and of some of its ethers and of some cyclic ethers. The durohydroquinone, a product of the pyrolysis of α-tocopherol, was found to be as active as α-tocopherol at the level of a 3-mg single dose, but the ethers displayed only slight vitamin E activity at the higher levels of 100- and 250-mg doses.

III. *Permanganate oxidation of alpha tocopherol*, O. H. Emerson. (Univ. Calif. et al.). (p. 40).—The method is described for oxidizing α-tocopherol with potassium permanganate. Analysis of the product of the oxidation shows fairly close agreement with the theoretical values calculated for the formula for α-tocopherol, $C_{29}H_{52}N_2SO_3$.

Vitamin K in the plant, H. Dam and J. Glavind (*Biochem. Jour., 32 (1938), No. 3, pp. 485–487*).—In continuation of previous studies (E. S. R., 76, p. 585) and with the cooperation of I. Svendsen, the authors determined the content of vitamin K in the green leaves, flowers, seeds, and roots of plants. The following are some of the values reported, expressed as units of vitamin K as defined by Schønheyder (E. S. R., 76, p. 585): Green leaves of chestnut 800, of spinach 550, of cabbage 400, and inner leaves of cabbage 100 units; unripe green tomatoes 100 and ripe tomatoes 50; ripe strawberries 15; soybean seeds 25; wheat bran 10; oats less than 10; wheat, wheat germ, and yellow corn less than 5; carrots about 10; potatoes less than 10; and peas grown in the light 35 and in the dark 25 units of vitamin K per gram of dry material.

Some deficiencies of nutrition and their relation to disease, I, II, C. C. Ungley (*Lancet [London], 1938, I, Nos. 16, pp. 875–882, figs. 7; 17, pp. 925–932, figs. 8*).—Two papers are presented.

I. *Origin and detection of nutritional deficiencies.*—The author discusses the factors adversely affecting food intake and leading to impairment of digestion and absorption, the deficiencies of essential food factors conditioned by the composition of the rest of the diet, the factors which increase the demands for nutrient elements or the rate at which they are catabolized, and other factors such as defective storage or imperfect utilization of food constituents and individual variations in the etiology of deficiencies of nutrition. The effects of deprivation of nutrient substances upon the cardiovascular and respiratory systems, the urinary tract, and the skeleton are reviewed, together with a clinical detection of nutritional deficiencies as evidenced by defects in digestion and absorption. The bibliography lists 85 references to the literature.

II. *Nutritional deficiency in relation to anaemia.*—This paper contains an extensive review of the recent research dealing with the macrocytic anemias due to a deficiency of substances effective in pernicious anemia and those resulting from a dietary deficiency other than the extrinsic factor, iron deficiency anemia, and the anemia of myxedema and the type frequently accompanying a vitamin C deficiency. The bibliography lists about 55 references to the literature.

Diseases of metabolism and nutrition: Review of certain recent contributions, I, II (*Arch. Int. Med., 61 (1938), No. 2, pp. 297–365*).—This review paper, which contains 224 references, is given in two parts.

I. *Diseases of metabolism*, R. M. Wilder (pp. 297–323).—The author discusses the disorders of fat metabolism, obesity, experimental diabetes, and the use of protamine zinc insulin and other insulins with prolonged action.

II. *Nutrition*, D. L. Wilbur (pp. 323–365).—Vitamin A, the components of the vitamin B complex, vitamin C, and vitamin D are reviewed under chemical structure, physiologic activity, and human requirements. Other subjects discussed are vitamin E in its relation to reproduction in the rat, the lack of established facts in regard to the human requirement for the vitamins F and K and the antigizzard-erosion factor, the presence of a factor termed vitamin "T" in sesame oil, the relationship of vitamin P to vitamin C, the human requirements for protein, iron, potassium, magnesium, and calcium and the part played by cobalt and by zinc in animal nutrition, and the significance of mild forms of deficiency diseases.

Nutritional anemia and its prevention, O. D. Abbott and C. F. Ahmann (*Florida Sta. Bul. 328 (1938), pp. 12*).—This bulletin, which is based chiefly on the laboratory and clinical experience of the authors, has been prepared to educate people of the State in the causes, treatment, and prevention of the most common forms of anemia as disclosed by examination of the blood of approximately 5,000 rural children and 100 pregnant women.

About 40 percent of the children were found to have hypochromic anemia due to deficiency of iron, which was mild in about three-fourths of the number (hemoglobin values from 50 to 70 percent and normal red cell count) and severe in the remainder (hemoglobin from 20 to 50 percent, with fewer and smaller red blood cells). Iron treatment of some of the more severe cases resulted in increase of hemoglobin to normal values in from 3 to 4 weeks even in subjects with hookworm, malaria, or enlarged tonsils. About 80 percent of the pregnant women examined were anemic. In most cases this condition could be attributed chiefly to a lack of iron, in a few others to disturbances of gastric acidity with impaired absorption, and in others to both dietary and gastric deficiency. Hemoglobin values as low as 35 percent were frequently found, but routine iron treatment supplemented with hydrochloric acid when indicated raised the hemoglobin values of all subjects to the normal range at the time of delivery.

Deficiencies in the diet are discussed from the standpoint of data on dietary habits of rural children in the State as secured in an earlier study (E. S. R., 64, p. 284) and food production on the farm as shown by unpublished data from a farm family living study. Curative measures are discussed, but with the statement that iron medication should be given only under the prescription of a physician.

The isolation and identification of the anti-black tongue factor, C. A. Elvehjem, R. J. Madden, F. M. Strong, and D. W. Woolley. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 123 (1938), No. 1, pp. 137–149, figs. 3*).—In continuation of previous studies (E. S. R., 79, p. 137), the authors demonstrated that commercial nicotinic acid and its amide isolated from liver are effective in curing and preventing blacktongue in dogs maintained on the modified Goldberger diet. The dosages administered varied from 25 mg in a single dose to 30 mg of nicotinic acid every other day for 56 days and 30 and 50 mg nicotinic acid amide in a single dose. It was found that the administration to a dog with blacktongue of a single dose of liver extract equivalent to 200 g fresh liver gave the same response as 50 mg of nicotinic acid amide, so that 100 g of fresh liver evidently contained about 25 mg of the amide. From the results of the feeding tests the nicotinic acid requirement of dogs is tentatively set at from 0.5 to 1.5 mg. per kilogram of body weight. A method is given for the isolation of nicotinic acid amide from liver, the total recovery being about 5 percent of the original material.

Anti-black tongue activity of various pyridine derivatives, D. W. Woolley, F. M. Strong, R. J. Madden, and C. A. Elvehjem. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 124 (1938), No. 3, pp. 715–723, fig. 1*).—In continuation of the study noted above, the authors tested the antiblacktongue potency of 19 compounds related to nicotinic acid by administering them orally in a single dose to dogs maintained on the modified Goldberger diet supplemented by additional amounts of thiamin and riboflavin. When a compound failed to show activity, the response of the dog to a single dose of nicotinic acid was tested. The following compounds were found to be active: Nicotinic acid, nicotinamide, ethyl nicotinate, nicotinic acid N-methyl amide, nicotinic acid N-diethyl amide, nicotinamide glucosidoiodide, and nicotinuric acid and to a less extent β-picoline. In doses equaling 3–4 times the effective dose of nicotinic acid, the following compounds proved inactive: Trigonelline, nicotinamide methochloride, pyridine, pyridine-β-sulfonic acid, 6-methylnicotinic acid, β-acetylpyridine, quinolinic acid, picolinic acid, isonicotinic acid, nipecotic acid, and nicotinonitrile. It is noted that the active compounds are those which are capable of oxidative or hydrolytic conversion to nicotinic acid and its amide in the body, indicating that a specific structure is required for antiblacktongue potency.

The influence of different casein preparations in riboflavin-deficient diets upon the appearance of cataract, P. L. Day and W. J. Darby (*Biochem. Jour., 32 (1938), No. 7, pp. 1171–1175, fig. 1*).—In continuation of previous studies (E. S. R., 79, p. 568), the authors report an investigation in which seven casein preparations were used as sources of protein in the riboflavin-deficient diet 625. The criteria used in comparing the caseins were average maximum growth, maximum weight gains and time to reach maximum weight, incidence and time of appearance of cataract, and survival period.

The results obtained with a dilute acid-extracted casein and with two vitamin-free caseins, Labco and Harris, were almost identical, the rats developing an unkempt appearance of the hair, some alopecia, and in practically all cases keratitis and cataract. The alcohol-extracted casein produced longer survival and prolonged growth and delayed the appearance of cataract. The Glaxo AB and Glaxo ABE and alcohol-extracted Glaxo ABE gave much longer survival periods and more prolonged growth, with further delayed development of cataract. The rats showed extensive loss of hair, excoriation of the skin, and severe keratitis, with cataract occurring less frequently. Eluates from the Glaxo caseins exhibited a marked greenish fluorescence similar to that produced by riboflavin when examined by ultraviolet light. Eluates from the other casein preparations gave no fluorescence with the exception of one vitamin-free casein (Labco), which gave a bluish fluorescence. It is concluded that the acid-extracted and the vitamin-free caseins contained little, if any, riboflavin, while the Glaxo and the alcohol-extracted caseins contained significant amounts.

Diet in the prevention of diabetes mellitus, D. Adlersberg and S. Siegal (*New England Jour. Med., 219 (1938), No. 6, pp. 194–197*).—In a discussion of the etiologic factors underlying diabetes mellitus and the prevention of the disease, the case history of an adult man is presented as an example of cases of transient nondiabetic glycosuria which, as a result of irrational and superfluous carbohydrate restriction, had been transformed into cases of mild diabetes. For the individual predisposed to diabetes, the author recommends a normal diet rather than a low carbohydrate-high fat diet.

The effect of nicotinic acid on pellagrins maintained on a pellagra-producing diet, J. M. Grant, E. Zschiesche, and T. D. Spies (*Lancet [London], 1938, I, No. 17, pp. 939–941*).—In this complete report of a study previously noted from a preliminary report (E. S. R., 79, p. 280), the authors observe that the administration of from 200 to 1,500 mg of nicotinic acid per day to seven patients brought about the disappearance of the ptyalism, Vincent's infection, and porphyrinuria and healing of the mucous membrane lesions within 48 hr., but failed to cure the peripheral neuritis. The patients had an improved sense of well-being, and five noted improvement in appetite.

Treatment of pellagra with nicotinic acid, M. Rachmilewitz and H. I. Glueck (*Brit. Med. Jour., No. 4049 (1938), pp. 346–348*).—The case histories of two adults with pellagra are presented to show that the oral administration of from 150 to 200 mg of nicotinic acid per day as a supplement to the basic pellagra-producing diet cured the symptoms within 9 and 13 days, respectively.

The changes in total calcium content of the bones during the development of rickets, B. Hamilton and W. J. Highman, Jr. (*Jour. Nutr., 15 (1938), No. 2, pp. 177–186*).—The calcium content of corresponding metatarsal bones of 12 rabbits was studied during the development of rickets by amputation of one leg at the beginning and of the other at the end of the test period. Evidence is presented to show that the calcium content of both legs removed at the same time is about equal to that in normal animals and that the amputation of one leg does not prevent the bones of the other leg from growing and increasing in total calcium content. The rabbits received the McCollum rickets-producing diet No. 3143, and the degree of rickets produced was determined by X-ray. Control animals received the standard stock diet and were killed and examined at the same time-intervals as the experimental rabbits.

At the end of the fourth week on the rachitic diet the degree of rickets present varied from + to +++. The total calcium content of the metatarsals had increased by from 2.2 to 5.3 mg and the bone length by from 1.5 to 3.9 mm in 3 of the rabbits, and in the other 5 the calcium content had decreased by from 5.2 to 33 mg and the bone length had increased by from 0.4 to 1.6 mm. In 5 control rabbits the calcium content of the metatarsals had increased by from 14 to 50.4 mg and the bone length by from 2.4 to 6.8 mm. From the fourth to the seventh week the degree of rickets ranged from ++ to +++, with healing evident in 2 of the 4 test animals, and the calcium content of the metatarsals decreased by from 1.6 to 43 mg and the bone length increased by from 0.9 to 2.2 mm. In 3 control rabbits the calcium content increased by from 18 to 45 mg and the length of the metatarsals by from 1.9 to 2.3 mm.

HOME MANAGEMENT AND EQUIPMENT

Outlook for farm family living in 1939 (*U. S. Dept. Agr., Misc. Pub. 332 (1938), pp. [2]+6*).—This annual report (E. S. R., 78, p. 735) deals with the general outlook for 1930 for farm family income and spending habits, sources of income in general and by region, and price prospects for foods, automobiles, radios, telephones, clothing and textiles, home equipment, operation, and improvements. Advice is given concerning the management of income.

Factors to be considered in preparing minimum-wage budgets for women, G. S. Weiss, M. Waite, and L. Stitt (*U. S. Dept. Agr., Misc. Pub. 324 (1938), pp. II+46*).—This publication contains information for use in making a commodity-quantity budget representing the level of living to be provided by a minimum wage. Basic material is given on the points to be considered in establishing criteria for adequate food, housing, clothing, medical care, transportation, and other living essentials. A method of collecting retail price data for use in the computation of the cost of minimum-wage budgets is discussed by S. Stewart.

An analytical study of self-reliance, L. H. Stott. (Nebr. Expt. Sta.). (*Jour. Psychol., 5 (1938), No. 1, pp. 107-118*).—This paper reports one of a number of preliminary studies made in connection with the investigation noted below. A series of 30 brief descriptions of attitudes and behaviors considered to characterize self-reliance or nonself-reliance in young people was prepared, and for each statement as nearly an exact opposite was formulated. The 60 items were then listed at random and presented as a preliminary test to 650 high school sophomores, each of whom was asked to indicate whether or not he considered himself similar to or different from the person described in the item. The results were then subjected to statistical analysis to determine the factors involved in the test and to what extent the statements in the negative form were equivalent to the same item in the positive form. It was concluded that the term self-reliance as applied to the group studied has at least four independent and distinct aspects, which are described as follows:

"Given the environmental opportunity and encouragement a child might grow to be self-reliant in regard to meeting his own personal problems, exercising his own judgment, and making his own decisions. He might develop self-reliance in the sense of self-direction of effort and the efficient use of time. Again he might become self-reliant and resourceful in group situations—a quality which is important in leadership. And finally, he might become self-reliant in the sense that he depends upon himself, and can be depended upon by others, to keep his appointments and agreements and, in general, to maintain satisfactory relationships with others." It was also concluded that the positive and negative forms of the same test should not be regarded as equivalent, but that each item should be considered separately and its final selection be based upon its validity and reliability rather than upon the assumption that it is equivalent to some other positively stated item.

The relation of certain factors in farm family life to personality development in adolescents, L. H. Stott (*Nebraska Sta. Res. Bul. 106 (1938), pp. 46, figs. 6*).—This bulletin reports for a farm group of 325 adolescent boys and 370 girls ranging from 11 to 22 yr. of age a study of the relation between certain home environmental influences and successful family life as defined in terms of the personality development of the subjects, the study being a part of a larger investigation, including also city and small town groups.

A set of nine personality scales was developed or adapted from existing scales to test, respectively, rationality of thinking, personal and social adjustment, honesty in the school situation, ethical or moral judgment, self-reliance (as noted above), resourcefulness in the group situation, personal responsibility, attitude toward work, and attitude toward home life. The scores as determined by these scales were interpreted as indices of success and correlated with information on various factors in the home environment as obtained from a questionnaire.

All the correlations between separate items in the home environment and personality scores were low, less than one-third of the 300 coefficients being large enough for statistical significance. "However, since personality traits are multiply determined, such low correlations are to be expected. Furthermore, certain of them may be regarded as of real significance."

The home life factors found to be most important in their influence on personality development of the adolescent subjects were those which involved to the greatest extent the activities, participation, and person to person interaction of the subjects themselves. Next in importance were factors concerned with the activities and the health, physical and emotional, of the parents. Ranking still lower were the physical aspects of the home environment, i. e., the economic and cultural status of the family.

Slight differences were found between boys and girls in average scores on certain of the personality tests and in the relation of these characteristics to the home environment. "Apparently it may not safely be assumed that what is favorable to the best personal development of the boy is also favorable in the same degree to the personal development of the girl. Farm boys and girls are not always affected in the same way or to the same degree by specific factors in the home environment."

The efficient pouring utensil, B. M. Kuschke and M. Whittemore (*Rhode Island Sta. Bul. 266 (1938), pp. 18, figs. 6*).—By means of a machine designed to regulate the rate of tipping, and by hand, pouring efficiency tests were made on 41 pitchers, 12 coffeepots, 9 teapots, 15 vinegar cruets and sirup pitchers, 7 saucepans with lips, and 4 teakettles, using water, oil, and sirup. The utensils were filled to different levels of capacity and tilted as rapidly as possible, avoiding spilling over the top, and the time recorded from the beginning of the flow until the stream no longer poured continuously. Observations were also made on the amounts of liquid left in the utensil when tipped to an angle of 90° by the pouring machine or as far as possible by hand and held until the stream no longer flowed continuously. From a study of the physical shapes and plan of the more efficient spouts, the following features are noted as the most important to promote good pouring qualities: The point where the spout or nose begins should be well down on the body of the container; the sides of the spout or nose should be high enough to prevent spilling when tilted and to direct the stream to the center, the bottom on the horizontal plane when the utensil is resting on the table, and the edge of the spout or nose thin or sharp to help prevent dripping and to cut the stream more rapidly; and to reduce adhesion between the liquid and the container a high glazed finish or luster is desirable.

MISCELLANEOUS

Fiftieth Annual Report [of Georgia Station, 1938], H. P. Stuckey (*Georgia Sta. Rpt. 1938, pp. 99, figs. 30*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Report of the Puerto Rico Experiment Station, 1937, [A. Lee] (*Puerto Rico Sta. Rpt. 1937, pp. II+115, figs. 28*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Publications available for free distribution (*Idaho Sta. Circ. 79 (1938), pp. 4*).—A list of the station and extension publications available as of November 1938.

Outline history of Indiana agriculture, W. C. Latta (*La Fayette: Alpha Lambda Chapter of Epsilon Sigma Phi, 1938, pp. 372, [figs. 169]*).—In this work, "the aim has been to trace, though very briefly, the gradual transition from the self-sufficing agriculture of 125 years ago to the self-renewing and increasingly profitable, balanced mixed husbandry of the present time."

Statistical tables for biological, agricultural, and medical research, R. A. Fisher and F. Yates (*Edinburgh: Oliver & Boyd, 1938, pp. VIII+90*).—A great variety of special tables, many already familiar to statisticians and supplemented by others not accessible elsewhere, is presented in convenient form suitable for the general research worker.

NOTES

Arkansas University and Station.—A new home economics building is under construction. This is a three-story structure of gothic architecture and limestone exterior, 190 by 58 ft.

Dr. B. P. Johnson, assistant professor of agronomy and assistant agronomist, has resigned and has been succeeded by Chris G. Schmitt. Max G. Weir and Lawrence A. Lewis have resigned as technical assistants at the Rice and Cotton Substations, respectively. Dr. S. B. Locke has been appointed as assistant professor of plant pathology. Dr. Neal W. Hilston, instructor in animal production and assistant animal husbandman in the Wyoming University and Station, has been appointed instructor and assistant animal husbandman vice Malcolm Lyons, who was killed accidentally on November 24, 1938, at the age of 27 years.

Connecticut State Station.—Dr. Wilton E. Britton, entomologist in charge and State entomologist since 1901, died February 15 at the age of 70 years. Dr. Britton spent his boyhood in New Hampshire, graduating from the New Hampshire College in 1893 and receiving the honorary D. Sc. degree from the same institution in 1930. He had also studied at Cornell University and received the Ph. D. degree from Yale University in 1903. He began his service in Connecticut in 1894 as station horticulturist, but became widely known for his work in entomology, especially along administrative lines, as in the mosquito and other campaigns. He was president of the Association of Economic Entomology in 1909.

Iowa Station.—Dr. George F. Stewart has been appointed research professor of poultry husbandry.

Kentucky Station.—Dr. H. W. Beers, associate professor of rural sociology and associate rural sociologist in Rutgers University and the New Jersey Stations, has been appointed rural sociologist, effective February 1.

Missouri University and Station.—Eckles Hall, a new two-story dairy building of white limestone, has just been completed. This building doubles the space formerly available for the department of dairy husbandry. It is proposed to make it the first unit of a larger animal industry development, which will later house the instruction and considerable of the research in animal husbandry.

Rutgers University and New Jersey Stations.—Herbert J. Baker, director of the extension service in agriculture and home economics since 1923, died January 6 at the age of 53 years. A native of Delaware, he was graduated from the Massachusetts College in 1911 and received the degree of master of education from Harvard University in 1930. After several years' service in the Massachusetts College in various capacities, he became director of the extension service in the Connecticut College in 1915 for the ensuing 8 years. In 1919 he was granted leave of absence for service in France, where he was director of the farm school at Allerey, a vocational subdivision of the A. E. F. University (E. S. R., 41, p. 106). In 1928 he carried on a Nation-wide survey of agricultural extension work for the U. S. Department of Agriculture.

Dr. Emil R. Biel has been appointed meteorologist.

Ohio State University and Station.—Dr. Arthur R. Mangus has been appointed associate in rural economics in the station, with headquarters at the university.

Wiley Memorial Awards.—Three awards of $300, $200, and $100 to senior students in accredited colleges and universities in North America for a thesis, compilation, or résumé on any one of the subjects dealt with in the methods of analysis of the Association of Official Agricultural Chemists are being offered by that association in memory of the work of Dr. H. W. Wiley. Not more than one candidate may be nominated by an institution, and all contributions must be in the hands of the secretary-treasurer, Dr. W. W. Skinner, on or before August 1, 1939.

Necrology.—Dr. Raymond A. Pearson, since 1935 special assistant to the Administrator of the U. S. D. A. Farm Security Administration and previously prominently associated for many years with the land-grant institutions, the Department, and other agencies, died at Hyattsville, Md., on February 13.

Dr. Pearson was born in Evansville, Ind., on April 9, 1873, and graduated in 1894 from Cornell University. He received the M. S. degree from Cornell in 1899, as well as the honorary degrees of doctor of laws from Alfred University in 1910 and doctor of agriculture from the University of Nebraska in 1917.

His service to agriculture began in the dairy laboratory of Cornell in 1894 and was followed by his appointment as Assistant Chief of the Dairy Division of the U. S. D. A. Bureau of Animal Industry a year later. In 1903 he returned to Cornell as professor of dairy industry and in 1908 became State commissioner of agriculture in New York.

In 1912 Dr. Pearson was appointed president of the Iowa State College, resigning in 1926 to become president of the University of Maryland, where he served for 9 years. In both institutions his administration was a time of expansion and development, with greatly enlarged equipment and resources, increased enrollments, and widened influence.

During much of this period, Dr. Pearson was also associated with other activities. During the World War he was an Assistant Secretary of Agriculture, making a special investigation of food conditions in Europe. Especially conspicuous were his services to the Association of Land-Grant Colleges and Universities, in which he was president in 1924 and chairman of the executive committee from 1919 to 1935. In the latter capacity he had much to do with the enactment of the Purnell and Bankhead-Jones Acts, as well as with other measures pertaining to agricultural education and extension. He devoted himself unsparingly to the furtherance of the association's interests, exercising a constructive leadership and well maintaining the standards set by Presidents Henry E. Alvord, Henry H. Goodell, Henry C. White, William Oxley Thompson, and others who had preceded him as chairman. He was a man of high ideals and broad vision, and his contribution to the cause of agricultural education was unique and substantial.

Dr. Tait Butler, awarded the American Farm Bureau Federation's medal in 1934 for distinguished service to agriculture, died in Memphis, Tenn., on January 13. He was born in Ontario on July 24, 1862, and graduated from the Ontario Veterinary College in 1885. He served as a teacher and investigator in veterinary medicine in the Mississippi College and Station from 1891 to 1896, the Kansas College and Station from 1900 to 1901, and the North Carolina College and Station from 1901 to 1906, and for much of this time was State veterinarian in Kansas and North Carolina. He also had been associated with the U. S. D. A. Bureau of Animal Industry in Indiana and Wisconsin.

Dr. Butler early became interested in farm journalism, founding the *Southern Farm Gazette* in 1895 and becoming editor of the *Progressive Farmer and Southern Ruralist* in 1909. For many years he exerted a wide influence for southern agriculture. He was president of the American Veterinary Medical Association in 1901 and the Association of Farmers' Institute Workers in 1908 and was associated with many other organizations.

Dr. W. B. Niles, widely known for his work on hog cholera, died in Covina, California, on January 23 at the age of 83 years. A native of Wisconsin, he was graduated from the Iowa College in veterinary medicine in 1885. Three years later he became professor of veterinary science and veterinarian in the newly established South Carolina Experiment Station, then a department of the University of South Carolina. He returned to the Iowa College in 1891, teaching various veterinary branches and serving as assistant veterinarian in the station, where he carried on studies on glanders, actinomycosis, bovine tuberculosis, and hog cholera. In 1898 he became connected with the U. S. D. A. Bureau of Animal Industry and thereafter was associated mainly with its hog cholera studies, working with Drs. M. Dorset and C. N. McBryde in the development of anti-hog-cholera serum. He retired from active service in 1928.

The March issue of *The Alumni Bulletin* of Massachusetts State College notes the death on November 12, 1938, of Dr. Arthur A. Brigham, an alumnus of the class of 1878, at the age of 82 years. "He had a long and interesting career that took him into the far corners of the world. He lived and worked in Sapporo, Japan, where he was professor of agriculture at the Imperial Agriculture College of Japan; in Göttingen, Germany, where he obtained the degree of doctor of philosophy; in Kingston, R. I., where he was professor of agriculture and director of the agricultural experiment station of the Rhode Island State College; in Ithaca, N. Y., where he was general manager of the Cornell Incubator Company; and in Brookings, S. Dak., where he was principal of the State School of Agriculture. His later years were spent in operating a poultry farm at Brinklow, Montgomery County, Md. In recent years he divided his time between Florida and Maryland."

Dr. Edward M. East, professor of genetics in Harvard University since 1926 and previously associated, mainly as a pioneer plant breeder, with the Illinois Experiment Station from 1900 to 1905 and the Connecticut State Station from 1905 to 1909, died November 9, 1938, at the age of 59 years. He was also widely known for his studies of human populations and their implications and as the author of numerous books, among them Mankind at the Crossroads (1923) and Heredity and Human Affairs (1927).

New journals.—*International Bibliography of Agricultural Economics* is being published quarterly by the International Institute of Agriculture at Roma. It will continue the bibliography of publications dealing with the economic and social aspects of agriculture begun by the institute in 1932 and of which nearly 25,000 titles have been published in *Berichte über Landwirtschaft*. The initial number lists publications received by the library of the institute from June 1 to October 15, 1938.

4-H Horizons is being published monthly (except in July and August) in Wellesley, Mass., as "a meeting place for 4-H club members, local leaders, and 4-H officials." The initial number contains a foreword entitled What Is 4-H Club Work, by the senior editor, Dr. C. B. Smith, recently retired as Assistant Director of Extension Work in the U. S. Department of Agriculture, and a discussion entitled Training Leadership for the Future, by C. W. Warburton, Director of Extension Work. Much of the issue is devoted to subject-matter material, news notes, and fiction.

Die Landwirtschaftlichen Versuchs-Stationen, begun in 1859 and therefore one of the oldest organs for scientific research in agriculture, has been renamed *Zeitschrift fur Tierernährung und Futtermittelkunde*. The initial number is confined to the work of the German agricultural experiment stations and a section of abstracts of recent German literature, but it is announced that original contributions are to be accepted from other sources and that the scope of the abstracts may be broadened.

Mycopathologia is being published at 's Gravenhage (The Hague), Netherlands, under the editorship of Directors R. Ciferri of Firenze (Florence) and P. Redaelli of Pavia, Italy. The initial number contains eight original articles and a mycopathological bibliography. One of the articles, Allergy in Monilia and Yeast Infections, by C. R. Owen et al., is a contribution from the department of bacteriology and immunology of the University of Minnesota.

The Australian Journal of Science is being published bimonthly by the Australian National Research Council at 157–161 Gloucester Street, Sydney, New South Wales. The initial number contains among others an article on The Place of Biology in Australian Education, by E. Ashby (pp. 3–9); Australian Avifaunal Problems, by T. Iredale (pp. 20–22); and The Social Relations of Science, by O. U. Vonwiller (pp. 30–32).

The Journal of Investigative Dermatology is being published bimonthly in Baltimore, Md. Among the articles in the initial number are On the Experimental Production of Xanthomas in Laboratory Animals, by F. Schaaf; The Nipple Test: Studies in the Local and Systemic Effects on Topical Application of Various Sex-Hormones, by W. Jadassohn, E. Uehlinger, and A. Margot; and Further Investigations of Poison-Ivy Hypersensitiveness in Guinea Pigs, by R. L. Kile and A. W. Pepple.

Subtropical Gardening and Fruit Growing is being published monthly at Orlando, Fla., for use in "areas where citrus fruits grow." The initial number contains a symposium on subtropical rose culture, a number of articles by members of the University of Florida staff, and an account of the dedication of the Fairchild Tropical Garden near Miami on March 23, 1938.

Following an interval of 5 years *Calcutta University Journal of the Department of Science* is being revived under a plan whereby three numbers will be issued each year. The initial number contains three articles, one of which is The Occurrence of *Phytophthora parasitica* Dast on *Caralluma (Boucerosia) diffusa* Wight, by S. Banerjee (pp. 53–71).

Record of Chemical Progress is being published quarterly by the Hooker Scientific Library, Central College, Fayette, Mo. The initial number consists mainly of condensations of chemical papers presented at the Richmond, Va., meeting of the American Association for the Advancement of Science and of an article by C. A. Browne entitled Samuel Cox Hooker, 1864–1935.

Lloydia, a quarterly journal of the biological sciences, is being published by the Lloyd Library of Natural History. Cincinnati, Ohio. The initial number contains seven articles, among which is one entitled The Morphology of *Artemisia tridentata* Nutt., by R. A. Diettert.

The Agrarian is being published quarterly by the students of Clemson College as "an official publication through which agricultural articles of widespread interest could be published."

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FEDERAL RELATIONSHIPS TO RESEARCH

On January 23, 1939, President Franklin D. Roosevelt transmitted to Congress the first volume of a series entitled Research—a National Resource. This volume, compiled under the sponsorship of the National Resources Committee, deals with the relation of the Federal Government to research. Subsequent volumes are contemplated on research by colleges, universities, and foundations, by business organizations, by the industrial laboratories, and by the State and municipal governments.

The importance and timeliness of this report will be readily apparent. As the President points out, "the dependence of civilization on science is universally recognized, but the extent of the activities of private and public agencies carrying on scientific inquiry is not generally known. It is unlikely that large numbers of our people have any adequate realization of the services which are being rendered by the executive agencies of the Federal Government through scientific researches in medicine, agriculture, economics, public administration, and the other natural and social sciences."

The report is a comprehensive volume of 255 quarto pages and is supplemented by a brief digest entitled Federal Relations to Research, which presents the matter in more popular fashion. Both documents are based on an extensive investigation which has been in progress since 1937 by the science committee of the National Resources Committee. The latter committee is a group of nine, organized in 1934 and headed by the Secretary of the Interior as chairman, with Mr. Frederic A. Delano as vice chairman, the Secretaries of War, Agriculture, Commerce, and Labor, the Works Progress Administrator, and three additional members. The science committee also comprises nine members, three of whom were designated by the National Academy of Sciences, three by the Social Science Research Council, and three by the American Council on Education. The study itself was in charge of a subcommittee on research of three members—Drs. C. H. Judd (chairman) and William F. Ogburn of the University of Chicago and Dr. Edwin B. Wilson of the Harvard School of Public

Health. There were also a technical staff and a corps of five special contributors, among whom were Director R. E. Buchanan of the Iowa Experiment Station and Dean A. A. Potter of the School of Engineering of Purdue University. Thus there was available a personnel of independent viewpoint, extensive experience with research programs and policies, and broad vision.

As the digest points out, "research is a national resource which cannot be measured in terms of money or amount. The quality of research, the facilities for it, the atmosphere in which it is undertaken, and the supply of research workers must be conserved and developed like other resources. Upon the experience and facts developed by research we base our planning and our policies in government, industry, business, education, and in our personal lives."

The Government of the United States has always found it necessary to carry on a program of scientific investigations. Even in the early days, "when there was little popular recognition of the importance of science and no adequate provision in this country for scientific research, the Government was compelled in the interests of defense, commerce, public health, and public finance to establish fact-finding agencies which supplied the information needed as a basis for legislation and administration." Especially within the present century, however, its interest has been greatly extended, so that today the Government assumes responsibility for scientific studies which deal with many general problems, such as the improvement of agriculture, the conservation of natural resources, and the development and maintenance of physical standards. "In all these extended researches the Government is serving the double purpose of directing its own operations and supplying the people with important scientific findings which they need for their private purposes."

The report makes it clear that the Government is by no means alone in conducting research along these lines, and that the universities, foundations, and other independent institutions, as well as industrial and commercial concerns, are making large contributions. It points out, however, that up to the present time these research agencies have developed independently and have given little attention to their interrelations. Whereas the governments of certain other countries have undertaken by direct exercise of authority to compel all who engage in research to coordinate their activities, in the United States compulsory coordination is impossible and undesirable. The only procedure which can succeed is voluntary cooperation based on agreement as to the best ways of making research productive. The belief is expressed that the survey which was undertaken should "contribute to an understanding of the proper sphere and range of research within the Government and would stimulate the consideration by nongovernmental research workers of the steps which may be taken better to solve the problems that arise in the conduct of research throughout the country."

The extent to which the Federal Government is engaged in research is shown to be by no means easy to ascertain with exactness. However, it is found that "research has never been a large part of the Federal budget." For the fiscal year 1937, the financial expenditure is estimated at about $1 per capita, or about 2 percent of the regular current expenses of the Government. This compares with an estimated outlay by 20 leading universities of about 25 percent of their income in this way and an allotment of over 4 percent of their gross income by some industrial concerns. Of the total amount of governmental expenditure for research, fully one-third is ascribed to investigations in agriculture.

In this connection considerable attention is devoted to the agricultural experiment stations, "set up at the land-grant institutions as centers of scientific experimentation. The Government contributes stimulation, support, and a measure of supervision to these experiment stations. The land-grant institutions are also used by the Government in the conduct of a program of extension education and service to the farmers of the country. Through this extension service the findings of research in agriculture and related subjects have been made available to the people of the Nation. In conducting local researches and in cooperating with governmental research, the land-grant colleges have given a demonstration of a method by which decentralized research activities can be stimulated and carried on in close cooperation with Federal agencies. . . .

"Great wisdom is being shown," it is stated, "in the management of the relations between the Department of Agriculture and the experiment stations. The Department of Agriculture as a scientific agency of the first order has experts in many lines. The services and findings of these experts are always available to the experiment stations and to other divisions of the land-grant colleges. The institutions have derived valuable assistance from the Department. They in turn have performed the important function of making State legislatures and the people of the country, especially the people in rural areas, aware of the value of research."

In further elaboration of these relationships, the report shows that "the Chief of the Office of Experiment Stations, through his administrative responsibility for the federally aided programs of the experiment stations and his jurisdiction over the regional laboratories, is able to coordinate the agricultural research work of the States both internally and with the program of the Department of Agriculture. As Director of Research for the Department and administrator of the special research fund he is charged also with the task of coordinating the research programs of the subject-matter bureaus and has general direction of the planning and development of the research program of the Department. In practice the program grows out of numerous conferences and discussions, considerable latitude being left to the bureaus, and the Director's function becomes primarily one of eliminating duplications and resolving conflicts. Coordination between research agencies serves both an administrative and scientific purpose. The administrative purpose is that of programing research activities to avoid duplication and to carry on service functions more effectively. The scientific purpose is to allocate research functions to those agencies best equipped to prosecute them, to keep workers in any given field informed of the activities of others in the same field, and to bring to bear on any specific problem the resources of all the sciences capable of contributing to a solution."

Among the handicaps confronting federally administered research are cited the difficulties in convincing appropriating agencies of its essential relation to the public welfare, especially as to the necessity for its consistent operation on a long-term basis and including adequate provision for the ultimate publication of its findings; the need of more satisfactory methods for recruiting, placement, and in-service training of research workers; and the desirability of organizing and encouraging decentralized research in institutions not directly related to the Government and by individuals not in its employ. As an example of the possibilities of a coordinated program of governmental and nongovernmental agencies, the experience is cited of the Tennessee Valley Authority (E. S. R., 80, p. 433) in making grants to research workers located in the land-grant colleges and elsewhere. It is pointed out, however, that "the Tennessee Valley Authority is much freer to use its funds for the employment of nongovernmental agencies than are the research bureaus in the departments in Washington."

The foregoing discussion leaves unmentioned many other points of interest and importance. The attempt has been merely to indicate some of the ways in which the report is of value. Perhaps its foremost contribution is its stalwart championship of research as a worthy recipient of Federal support. The case is well set forth in the concluding paragraph of the digest as follows: "The development of research is inevitable; it is quite as certain as the progress of civilization. Research will profit in the long run if its defenders are bold in presenting its claims and insisting that these claims are legitimate and imperative. As the President wrote in his letter approving this survey: 'Research is one of the Nation's very greatest resources.' "

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Correlations between biological essentiality and atomic structure of the chemical elements, R. A. Steinberg. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *57* (*1938*), *No. 11, pp. 851–858*).—Correlations between atomic structure and biological essentiality of the chemical elements were found to indicate that the essential elements are closely correlated with respect to atomic structure and their distribution among the nonessential elements. "Tentative, though vague and debatable, deductions are feasible with respect to the number and identity of the essential elements as yet unknown. A suggested form of chemical periodic table based on shell and subshell of transition, atomic number, and rank is superior in certain respects to the standard table. Moreover, this arrangement of the chemical elements makes possible the correlation of atomic structure with the property of biological essentiality."

The colloidal behavior of flour doughs, III, IV. (Minn. Expt. Sta.). (*Cereal Chem., 15* (*1938*), *Nos. 4, pp. 438–444, figs. 2; 5, pp. 708–711*).—Two papers of this series (E. S. R., 80, p. 439) are here noted.

III. *Studies upon the properties of flour-starch-water systems*, M. C. Markley.—The author reports that absorption of flour-starch-water doughs is at a minimum at approximately 7 percent protein. Magnitude of the absorption at 7 percent protein level for such doughs is a measure of the water-holding quality of the gluten independent of its concentration. Doughs made from flour-starch mixtures of less than 7 percent protein have the physical characteristics of starch pastes. Doughs made from flour-starch mixtures of more than 7 percent protein have the physical characteristics of normal flour doughs of similar protein content. Development time of doughs is a function of the amount of protein over 7 percent. At levels below 7 percent there is no differentiation. The gluten in bread crumb appears to be in the form of an envelope around each starch granule. About 7 percent of gluten is required to form the protein envelope around the starch granules.

IV. *The causes of the increase in mobility of doughs upon prolonged mixing*, M. C. Markley and C. H. Bailey.—The rate of increase in mobility of flour doughs upon overmixing is shown to be a function of many factors, including mechanical degradation of the gluten structure; proteolytic activity; the thixotropic nature of the starch in the presence of water; the action of α-amylase; the presence of embryo constituents such as cysteine, glutathione, and possibly certain unidentified substances; the ions in the dough solution; baking ingredients such as salt, bromate, and milk; and even the manner in which the wheat was conditioned for milling. The use of this rate of increase in mobility upon prolonged mixing is felt to be impractical as a simple and direct measure of flour strength, since it is the resultant of so many variable factors.

The cereal amylases with reference to flour and malt behavior, M. J. Blish, R. M. Sandstedt, and E. Kneen. (Nebr. Expt. Sta.). (*Cereal Chem., 15* (*1938*), *No. 5, pp. 629–657, figs. 8*).—β-Amylase was found to be abundant in ungerminated cereals and to be the predominant enzyme in these and in wheat flour. Most flours were found also to contain small, variable quantities of α-amylase and of "a biocatalytic factor that promotes a relatively slow disastasis of raw starch. β-Amylase is without significant action on raw, native wheat-starch granules. Its distinctive property is its saccharifying action on starch that has been rendered available . . . by physical, chemical, or biological means. Its action ceases when approximately 60 percent of such a starch substrate has been saccharified. The remaining and resistant 40 percent is a dextrin, . . . 'α-amylodextrin,' which retains its property of being colored blue with iodine. The greater the concentration of β-amylase, the more rapidly will the 60 percent conversion level be reached."

It was further found that "α-amylase, the so-called 'dextrinogenic amylase,' permits the saccharification of 'soluble' starch to proceed beyond the 60 percent conversion level, and the greater the concentration of α-amylase . . . the higher the conversion level. Degree of increased saccharification is not directly proportional to increase in α-amylase concentration, the behavior following the law of diminishing returns." Numerous other observations are also recorded.

The preparation and properties of wheat proteinase, A. K. Balls and W. S. Hale. (U. S. D. A.). (*Cereal Chem., 15 (1938), No. 5, pp. 622–628, fig. 1*).—The proteinase of wheat, perhaps accompanied by a peptidase, has been separated from bran by chemical means and considerably concentrated. The properties of the partially purified proteinase show that it is an enzyme of the papain type. It becomes inactive on standing in air and may be reactivated by the addition of cysteine. The active enzyme digests casein, clots milk, and lowers the viscosity of gelatin. It is inactivated by persulfate, bromate, and metavanadate, also by iodoacetic acid.

A study of the effect of proteoclastic enzymes upon wheat gluten solubility in sodium salicylate solutions, R. H. Harris. (N. Dak. Expt. Sta.). (*Cereal Chem., 15 (1938), No. 5, pp. 690–707, figs. 4*).—In general, the proteolytic enzymes tested (in a dough of hard red spring wheat flour) hastened dispersion of the gluten, and this effect was found to increase with increasing enzyme concentration.

Of the enzymes studied, bromelin and pancreatin appeared to exert the greatest influence upon gluten dispersion, while taka-diastase appeared to decrease the solubility. "This effect of taka-diastase may be explained by an initial coagulation of the gluten protein." Yeast water, which possessed no proteolytic activity itself, showed a decided activating effect upon the flour proteases. Malt diastase had a very noticeable influence upon gluten solubility and is distinctly proteolytic in action. Potassium bromate inhibited papain when present in relatively large concentrations in respect to enzyme. This effect was not very apparent when the enzyme concentration was increased. Bromelin was very strongly repressed at all concentrations used. Some repression of the activated flour proteases appeared to take place in the yeast-water treatment. Pepsin appeared to be the only enzyme investigated which did not evidence repression by bromate but showed instead possible activation, especially with low bromate concentration. Several of the enzymes gave indications of possible activations by bromate when it was present in relatively small quantities, whereas heavier dosages induced repression. "An alternative explanation may be advanced in the case of taka-diastase, where this effect of bromate may be attributed to repression of a possible coagulative effect of this enzyme upon the flour gluten."

Oxidation of starch—action of bromine on gelatinized corn starch, G. Felton, F. F. Farley, and R. M. Hixon. (Iowa Expt. Sta.). (*Cereal Chem., 15 (1938), No. 5, pp. 678–689, figs. 4*).—Oxidation of primary alcohol groups as estimated by the carbon dioxide evolution method reached a maximum when six equivalents of bromine per glucose unit were used. The values obtained indicated 50.7 percent when calculated as glucuronic acid anhydride. The evidence indicated that a portion of this carbon dioxide came from keturonic acid structures rather than from glucuronic acids. Oxidative production of nonuronic carboxyl groups was measured by the calcium content in excess of that calculated to neutralize the uronic acids present. Nonuronic carboxyls were not produced in appreciable quantity until more than three equivalents of bromine were used. Secondary alcohol oxidation to ketone groups as measured by reducing value reached a maximum value with two bromine equivalents. Oxidation of glycol groups was indicated by the decomposition of the reducing units in the late stages of oxidation and by the molecular degradation of the starch molecule as established by the decrease in optical rotatory power and the increase in calcium content.

Removal of the bran from cereals, R. H. Carr. (Purdue Univ.). (*Cereal Chem., 15 (1938), No. 5, pp. 658–662, figs. 2*).—The author treated 50 g of grain which had been dried to constant weight at 100° C. with 8 cc of sulfuric acid (sp. gr. 1.84). This was stirred for 2 min. to coat each grain with the acid, and stirring was continued each minute for 10 min. or until all the seed coats had been blackened, which required about 10 min. for wheat and 20 min. for corn at room temperature of 25°. The blackened grains were treated with 3 cc of nitric acid (sp. gr. 1.42) added drop by drop and stirred constantly. "As the temperature rises the black grains turn yellow, some brown fumes come off, and a yellow layer resembling whipped cream gathers on the top of the grain as the nitration continues. This process requires from 2 to 3 min., depending on the kind of grain treated." The wheat and bran layers were treated with 300 cc of distilled water with constant stirring, and the bran residue was decanted off through a Buchner funnel (15 cm) on a dried and weighted paper filter. The grain was washed with water until 1,500 cc of wash water had been obtained or until the water was no longer acid. The water was then decanted off, and the grain was dried in an oven to constant weight at 100°. It was again weighed, and the loss of weight from the original 50 g was calculated as bran.

[Proceedings of Southern California Branch of the Society of American Bacteriologists] (*Jour. Bact., 36 (1938), No. 4, pp. 452, 453*).—This report of proceedings includes abstracts of two papers from the University of California as follows: Precursors to the Formation of Creatinine by Bacteria, by T. D. Beckwith and C. H. Fish, and The Effect of Indol-3-Acetic Acid Upon Multiplication of *B[acillus] coli-communis* and *B. typhosus*, by T. D. Beckwith and E. H. Geary.

Flagella staining as a routine test for bacteria, H. J. Conn and G. E. Wolfe. (N. Y. State Expt. Sta.). (*Jour. Bact., 36 (1938), No. 5, pp. 517–520*).—The authors propose a procedure so simplified as to be applicable as a routine method for determining motility.

The preparation of the slides was found to be a crucial point. New slides are to be cleaned in the dichromate fluid, washed, rinsed in 95 percent alcohol, wiped with clean cloth, and flamed. "Pass each slide back and forth through a flame for some time, ordinarily until the appearance of an orange color in the flame. Some experience is necessary before the proper amount of heating can be accurately judged. Cool slides gradually in order to reanneal, and thus to minimize breakage." Placing the slides on a hot-water bath and allowing them to cool with it usually sufficed for this annealing.

The standard procedure is essentially the Hofer and Wilson modification (E. S. R., 79, p. 456) of the P. H. H. Gray[1] stain for flagella. The organisms are transferred to distilled water a short time before smearing on the slide, the period in water being another critical stage, in that "standing in the water should be just long enough to allow the flagella to become untangled. Too long a time results in their breaking off." Gum-producing forms required 30 min., others from 5 to 10 min.

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[1] Jour. Bact., 12 (1926), No. 4, pp. 273, 274.

The method is found to take somewhat more time than the conventional hanging-drop test, but it gives more definite results and a larger percentage of positive detections of motility.

Some effects of association and competition on Acetobacter, R. Vaughn. (Univ. Calif.). (*Jour. Bact., 36 (1938), No. 4, pp. 357–367, figs. 2*).—*Acetobacter* cultures which seemed to be similar in their characteristics from the standpoint of detailed laboratory study reacted differently when grown in association with other organisms. It was found that the power of rapid acetification is not shown by all strains of *Acetobacter* when grown in association with yeasts. The bacteria isolated from "stuck" wines all possessed this characteristic whereas strains obtained from various collections were unable to bring about rapid acetification when grown with yeast at 37° C. One known strain of *A. aceti* caused a small amount of acetification when grown in association with yeast at 30°.

The rate of acetification was also influenced by the types of yeasts grown in association with the bacteria and by the temperature of incubation.

The proteolytic enzymes of bacteria.—I, The peptidases of Leuconostoc mesenterioides, J. Berger, M. J. Johnson, and W. H. Peterson. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 124 (1938), No. 2, pp. 395–408, figs. 3*).—The authors elaborated a method for the preparation, from bacterial cells, of autolysates containing peptidases and confirmed the presence of acidopeptidases in certain bacteria. They find that the *Leuconostoc* peptidase system is capable of hydrolyzing both optical components of the racemic peptides, leucylglycine, leucyldiglycine, alanylglycine, and alanyldiglycine. Hydrolysis of *dl*-leucylglycine and *dl*-alanyldiglycine, by *Leuconostoc* enzymes appears to be activated by a rather large number of metal ions. The peptidase complex appears to contain at least two dipeptide-splitting enzymes, at least three polypeptidases, and an acylase, but no carboxypolypeptidase.

The proteolytic enzymes of bacteria.—II, The peptidases of some common bacteria, J. Berger, M. J. Johnson, and W. H. Peterson. (Wis. Expt. Sta.). (*Jour. Bact., 36 (1938), No. 5, pp. 521–545, figs. 6*).—Continuing the work above noted, the authors determined the pH optima for the hydrolysis of alanylglycine by two organisms, leucylglycine by three, diglycine by two, alanyldiglycine by two, leucyldiglycine by seven, and triglycine by one organism. In most cases the optimum value for peptide hydrolysis was between pH 8 and 9. Two organisms, *Lactobacillus pentosus* and *Propionibacterium pentosaceum*, were found to contain acidopeptidases which showed optimum pH values of from 5.5 to 6.0.

In most cases the peptidases were quite stable at pH 8 and 40° C., but the leucyldiglycine-splitting enzymes of the anaerobes (*Clostridium sporogenes, C. butylicum*) were then very unstable. This instability was partly overcome by the addition of reducing agents, which for *C. butylicum* activated the hydrolysis of alanyldiglycine and leucyldiglycine. The peptidase systems of *Bacillus megatherium* and *Escherichia coli* readily hydrolyzed dipeptides and tripeptides, but acylated or decarboxylated peptides were hydrolyzed only very slowly or not at all. Substitution of a methyl group for a hydrogen atom of the free amino group on a peptide resulted in a very marked decrease in hydrolysis. In *E. coli, Proteus vulgaris, Pseudomonas fluorescens,* and *Phytomonas tumefaciens* a leucylpeptidase-like enzyme was found by which hydrolysis of leucyldiglycine was activated by 0.003 M Mg^{++}. Appreciable amounts of peptidases were found in culture filtrates of *E. coli* and *B. megatherium.* With *E. coli*, more enzymes could be extracted from the cells than from the medium on which they were grown. With the proteolytic organism *B. megatherium*, more peptidases were found in a given volume of medium than could be obtained from the cells grown on the same volume of medium.

Enzymes of fruit and vegetables, W. V. Cruess. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 17 (1938), Nos. 5, pp. 133–137, 153; 6, pp. 166–169, 187; 7, pp. 199–202*).—The three parts of this article discuss the general nature of enzymes and enzyme action and take up briefly several fruit, vegetable, yeast, and mold enzymes.

Determination of ascorbic acid (vitamin C) in milk, O. F. Garrett. (N. J. Expt. Stas.). (*Jour. Milk Technol., 1 (1938), No. 3, pp. 37–39*).—A rapid titration method for determining the ascorbic acid content of milk, using a standard solution of 2,6-dichlorophenolindophenol as the titrating agent, is fully described.

Report of committee on standard methods for the bioassay of vitamin D milk, H. T. Scott et al. (*Jour. Milk Technol., 1 (1938), No. 3, pp. 49–52*).—The proposed methods are described in detail.

The isolation of a crystalline compound with vitamin K activity, S. A. Thayer, D. W. MacCorquodale, S. B. Binkley, and E. A. Doisy (*Science, 88 (1938), No. 2280, p. 243*).—Crystalline material separated from a petroleum ether extract of alfalfa meal showed high vitamin K activity equivalent to about 0.6 chick unit per microgram. These crystals possessed greater vitamin K potency than any fraction previously obtained in these studies, and they could be recrystallized from a variety of solvents without loss of potency.

An asbestos KCl bridge and a simple calomel electrode, C. E. ZoBell and S. C. Rittenberg. (Univ. Calif.). (*Science, 86 (1937), No. 2239, p. 502, fig. 1*).—Small threads of asbestos are freed of mineral impurities by leaching in dilute HCl and water. Each thread is heated to incandescence in a gas flame, after which it is sealed through the end of a glass tube of the desired length and diameter. The tubes can be filled with the KCl solution either with a long capillary pipette or by immersing in a vessel containing the hot solution and permitting it to cool.

Agricultural analysis: A handbook of methods excluding those for soils, C. H. Wright (*London: Thomas Murby & Co., 1938, pp. IX+343, figs. 8*).—This book is a laboratory manual giving the details of the methods of analysis of fertilizers, feeding stuffs, milk, milk products, insecticides, and fungicides, with reference to the sources of information. It also details the preparation of the indicators and standard solutions used in the methods described and the data required for calculating the results. It is intended for agricultural analysts with limited library facilities, "but it is hoped that it will also be of use to research workers and advanced students."

The chemical analysis of foods and food products, M. B. Jacobs (*New York: D. Van Nostrand Co., 1938, pp. XXII+537, figs. 56*).—This book is designed to present a systematic coverage of chemical food analysis, including the newer products, adulterations, and methods.

The chemical analysis of foods: A practical treatise on the examination of foodstuffs and the detection of adulterants, H. E. Cox (*Philadelphia: P. Blakiston's Son & Co., 1938, 2. ed., pp. IX+329, figs. 41*).—In the preparation of the present edition of this manual "particular attention has been given to methods for the determination of preservatives, of metallic impurities, of fluorides and substances such as ascorbic acid and enzymes, which though small in quantity are dietetically important."

Acidity in cereals and cereal products, its determination and significance, L. Zeleny and D. A. Coleman. (U. S. D. A.). (*Cereal Chem., 15 (1938), No. 5, pp. 580–595, figs. 6*).—The authors find methods involving extraction with strong alcohol to determine most of the free fatty acids, with varying proportions of the acidity due to acid phosphates and amino acids. A method involving extraction with 67 percent alcohol "extracts the major part of all three types of acids but fails to determine quantitatively the amino acids extracted." Water extraction determines acidity due mainly to acid phosphates. It is the authors' opinion that "fat acidity alone appears to be a more reliable index of soundness in grain than either of the other types of acid present or than any combination of these acid fractions as determined by any of the commonly used methods."

A colorimeter for the phosphatase test, W. H. Boynton and P. E. Nelbach (*Jour. Milk Technol., 1 (1938), No. 4, pp. 8, 9, figs. 4*).—A simple colorimeter, using permanent color standards, is described. This colorimeter used in studies of the phosphatase test has given consistent results and has greatly facilitated the reading of results of the test.

Opportunities for chemurgic research in California, W. V. Cruess. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16 (1936), No. 4, pp. 102–105, 118, 119, 123*).—This is a talk on industrial utilization of farm crops.

Handbook of food manufacture, F. Fiene and S. Blumenthal (*New York: Chem. Pub. Co. N. Y., Inc., 1938, pp. VI+603*).—This book is offered as "a handbook of practical food information, containing factory-tested commercial formulas and descriptions and analyses of prepared foods and raw materials."

Commercial fruit and vegetable products: A textbook for student, investigator, and manufacturer, W. V. Cruess (*New York and London: McGraw-Hill Book Co., 1938, 2. ed., pp. X+798, figs. 109*).—Since the appearance of the 1924 edition (not noted) "it has been necessary completely to revise some chapters, such as those on vitamins, canned-food spoilage, tomato products, and canning, and to add several new chapters, viz, those on plant pigments, enzymes of fruits and vegetables, freezing storage of fruits and vegetables, and the making of wines." The book deals with micro-organisms in relation to fruit and vegetable products, general principles, and methods. It contains also a brief history of canning; a discussion of tin and glass containers, general considerations in establishing a cannery and processes used in commercial canning, drying, and freezing, the manufacture of numerous specific products, including oils, wines, vinegars, pickles, etc., and the treatment of wastes and byprducts.

Hydrogen swelling and perforation of the tin plate container by fruit products, B. Parrish. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 17 (1937), No. 1, pp. 17, 18*).—Since tin tends to become less electropositive with respect to iron in the less acid juices, the sirup to be used in the canning of fruits of low acidity should be adjusted by the addition of citric acid. Closing and exhausting, with other mechanical details, were found very important. Sulfur compounds in the sugar accelerated the corrosion effected by highly acid products. Oxygen must be excluded with special care. Small quantities of some such corrosion inhibitor as agar-agar may be useful.

[Experiments on blanching of vegetables], M. A. Joslyn and G. L. Marsh. (Univ. Calif.). (*West. Canner and Packer, 30 (1938), Nos. 5, pp. 21, 22; 7, pp. 35–37; 8, pp. 37–40*).—Experiments to determine optimum conditions for blanching in preparation for freezing are described. Each vegetable showed different optimum conditions for blanching, but relatively long blanching below the boiling point appeared preferable to a shorter period at a temperature higher than 212° F., and steam seemed to give less uniform results than did hot water.

A note on canning and bottling of vegetable juices, W. V. Cruess, W. B. Thomas, and R. Celmer. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16 (1937), No. 11, p. 324*).—Because of an increased interest in vegetable juices as health beverages, the authors have made experimental packs of celery, asparagus, spinach, and carrot juices. Adding citric acid to the extent of 0.4 g per 100 cc brought the pH below the botulinus spoilage danger point and gave products of good flavor.

Fruit and vegetable juices, D. K. Tressler (*Fruit Prod. Jour. and Amer. Vinegar Indus., 17 (1938), Nos. 7, pp. 196–198, 210; 8, pp. 235–237, 249*).—This is a discussion of manufacturing processes and practices applicable to a wide variety of commercially prepared fruit juices.

Notes on celery juice, W. V. Cruess and F. Yerman (*Fruit Prod. Jour. and Amer. Vinegar Indus., 17 (1937), No. 1, p. 9*).—The process for the commercial canning of celery juice is outlined. Good yields of the juice were obtained, and a product of good appearance and flavor could be made.

Experiments on the canning of apple juice, R. F. Celmer and W. V. Cruess. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16 (1937), No. 12, pp. 356–359, 379*).—The authors discuss choice of fruit, which should have marked flavor, aroma, and tartness; removal of spray residue by an acid bath, which is "vitally important"; crushing; pressing; deaeration; filtration; further deaeration to eliminate oxygen taken up during filtration; flash pasteurization, for which a temperature of 185° F. is recommended; and canning, for which berry enamel lined type L or like tins, a temperature of from 175° to 185°, and cooling immediately after sealing are specified.

Removal of sugars from apple pomace, G. L. Baker and M. W. Goodwin. (Del. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 17 (1938), No. 8, pp. 232–234*).—The newer leaching methods developed by the station remove most of the starch by diastatic hydrolysis during the leaching procedure. Data directed to the apple byproduct industry and showing the quantities of sugar extracted by several leaching procedures as applied to a typical pomace are presented.

Use of starters for green olive fermentations, W. V. Cruess. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 17 (1937), No. 1, p. 12*).—The author tested five species of *Lactobacillus* (*L. pentoaceticus*, *L. gayoni*, *L mesenteroides*, *L. mannitopoeum*, and *L. pentosus*) for fermentation of green olives. The flavor of all of the olives inoculated with the lactic cultures developed very satisfactorily, and that of olives fermented with *L. pentosus* and *L. pentoaceticus* appeared to be the best. *L. pentosus* appeared to be worth trying commercially.

Greek olive investigations, D. Pomeroy and W. V. Cruess. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16 (1936), No. 1, pp. 11–13, 22, 27; 2, pp. 43, 44, 59*).—The authors report an investigation of the conditions under which a product of this type can be made without mold development during or after preparation. Processes applicable on a commercial scale are suggested.

Improved Delaware jelly strength tester, G. L. Baker. (Del. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 17 (1938), No. 11, pp. 329, 330, fig. 1*).—Air pressure upon a plunger, increased to the point at which the plunger breaks through the surface of the jelly, is read from a manometer. The increasing air pressure is provided by running mercury into an otherwise closed chamber connected to the cylinder in which the plunger piston operates.

Preparation of dextrose vinegar.—I, Alcoholic fermentation. II, Large scale experiments, R. F. Cohee, Jr. (Iowa State Col.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16 (1937), Nos. 8, pp. 237, 249; 9, p. 266*).—The concentration of 15.2 percent regular dextrose was found to be the optimum and gave reliable 6.6 percent alcohol yields upon fermentation. Barley sprouts at a concentration of 2 percent gave the best results of all the nutrients examined. The alcohol wash produced from dextrose and barley sprouts was, upon filtration to remove the yeast, clear, light colored, of good taste, and proper alcohol content. The studies on plant scale verified the laboratory results.

Destruction of volatile acidity of wine by film yeasts, W. V. Cruess and A. Podgorny. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 17 (1937), No. 1, pp. 4, 5*).—Certain yeasts growing as surface films reduced volatile acidity in wines to which they were added, their action appearing to be mainly that of oxidizing acetic acid to carbon dioxide and water. After the desired reduction of volatile acidity a yeasty flavor was present but disappeared after a sufficient time in storage in completely filled and sealed containers. In commercial practice the process should be followed microscopically and analytically and should be preceded by either pasteurization or a sterilizing filtration and by the addition of 100 p. p. m. of sulfur dioxide.

Summary of practical investigations on film yeast, W. V. Cruess, C. Weast, and R. Gilliland (*Fruit Prod. Jour. and Amer. Vinegar Indus., 17 (1938), No. 8, pp. 229–231, 251*).—Film yeasts, including the Spanish sherry type, and one superior to any of the Spanish yeasts tested, were studied with respect to their possible use in the wine industry.

The use of inert gas or mineral oil in the storage of wine, L. Cash. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16 (1936), No. 1, pp. 4, 5*).—The author's tests indicated that, under the experimental conditions used, layers of oil as thick as 1 cm did not prevent growth of aerobic organisms, rise in volatile acidity, or oxidation of SO_2. Furthermore there was found to be some danger of emulsification of oil with the wine.

Storage under carbon dioxide or nitrogen was found superior to storage under oil. Of the two gases carbon dioxide gas was found better, provided care was taken to avoid charging the wine with the gas.

Electrolytic production of rancio flavor in sherries, M. A. Joslyn. (Univ. Calif.). (*Indus. and Engin. Chem., 30 (1938), No. 5, pp. 568–577, figs. 7*).—The author finds that oxidation is necessary for the production of the characteristic flavoring constituents of sherry wines. One of the products of this oxidation is acetaldehyde formed by the activity of aerobic film-forming yeasts in the true Jerez wines of Spain and by controlled oxidation in California sherry-type wines. Using aldehyde content as an index of oxidation, the author found that electrolysis of the wine brings about a more rapid oxidation than that found in the normal sherry cooking process. The electrolytic oxidation produces flavoring constituents in the wine which closely resemble those of Spanish sherry in odor. It also brings about a rapid blending of brandy with the wine. However, the electrolytically treated wines lack the taste of sherries because electrolysis has but little effect on the other factors concerned in the production of sherry flavor. Decreasing the extent of electrolysis and increasing the heating period are suggested to bring about a better balance among the flavoring constituents. The wine used for sherry material must be properly selected.

Symposium on plastics (*Philadelphia: Amer. Soc. Testing Materials, 1938, pp. [5]+51, figs. [7]*).—The following papers were presented at the regional meeting at Rochester, N. Y., on March 9, 1938: The Properties of an Ideal Plastic, by A. F. Randolph (pp. 1–7); A Discussion of Testing Methods for the Determination and Comparison of the Strength Properties of Various Organic Plastics, by H. M. Richardson (pp. 9–11); A Review of Methods for Measuring the Thermal Properties of Plastic Materials, by W. A. Zinzow (pp. 15–22); Flow Relations of Thermoplastic Materials, by C. H. Penning and L. W. A. Meyer (pp. 23–28); Hardness—As Applied in the Plastics Industry, by J. C. Pitzer (pp. 31–34); and Permanence of Plastics, by G. M. Kline (pp. 35–50).

Industrial uses of "synthetic" plastics making rapid strides, D. C. CARPENTER (*Farm Res. [New York State Sta.], 5 (1939), No. 1, pp 1, 9, figs. 5*).—This is a popular discussion of plastics made from casein, cellulose, and other substances. The possibility of soybean protein as a casein substitute is mentioned, but the author doubts if any real threat to the dairy farmers' market for skim milk for casein manufacture is to be expected from soybean proteins.

AGRICULTURAL METEOROLOGY

The locating of tropical storms by means of associated static, J. WEIL and W. MASON (*Fla. Engin. Expt. Sta. Bul. 3 (1936), pp. 34, figs. 19*).—While the results obtained by this study (methods and apparatus described) indicate the probable feasibility of charting storms by electrical methods, it is realized by the authors that these observations are based on a single storm (July 1936). Furthermore at least two and preferably three or more stations are deemed necessary so that, by triangulation, the actual positions of storms can be determined. The data indicate that the observed rays gave, in general, an indication corresponding to the center of the storm, but this is not definitely proved, and it cannot as yet even be said that static emanates from all tropical disturbances. It is believed that improvements in the photographic technic have overcome many of the difficulties encountered and that data may now be obtained from synchronous operation. "While this method looks promising, it has not yet been developed to a point where successful and accurate forecasting is always possible. Some storms, either because of size, distance, or static conditions, may never be followed by this method."

Rainfall intensities and frequencies, A. J. SCHAFMAYER and B. E. GRANT (*Amer. Soc. Civ. Engin. Trans., 103 (1938), pp. 344–401, figs. 17*).—"An investigation of the relation of frequency to rainfall intensity, by the statistical method, forms the basis of this paper. All the available records of excessive rainfall published by the United States Weather Bureau for 19 cities were first examined and those exceeding certain rates were tabulated and plotted on semilogarithmic paper. The graphs were straight lines of marked regularity in their arrangement. Then, the data from 10 cities of the original 19 were tabulated and plotted, thus using about one-half the quantity of data first used. A similar regularity and consistency in the curves were found. Finally, the data from 14 rain gages in the Chicago (Ill.) District were used for finding curves and formulas for the use of the City of Chicago. The formulas for intensity are rectangular hyperbolas and are plotted on hyperbolic paper as straight lines. The study is limited to excessive storms having durations of 120 min. and less."

The effect of the degree of slope and rainfall characteristics on runoff and soil erosion, J. H. NEAL. (Univ. Minn.). (*Soil Sci. Soc. Amer. Proc., 2 (1937), pp. 525–532, figs. 8*).—The essential features of this paper have been previously noted from another source (E. S. R., 80, p. 116).

Rainfall characteristics of Missouri in relation to runoff and erosion, L. D. BAVER. (Univ. Mo.). (*Soil Sci. Soc. Amer. Proc., 2 (1937), pp. 533–536, figs. 4*).—This is a preliminary report of a study of the rainfall factor—one of the most important variables in the complex run-off and erosion problems.

The scientific aspects of flood control. (U. S. D. A. et al.). (*Amer. Assoc. Adv. Sci., Occas. Pubs., No. 3 (1936), pp. 47, figs. 37*).—In this symposium sponsored by the Ecological Society of America and the American Association for the Advancement of Science (1936), after an introductory statement by W. S. Cooper, the following papers are included: Forests and Flood Control, by F. A. Silcox (pp. 5–16); Agricultural Land Use and Flood Control, by W. C. Lowdermilk (pp. 17–39); and On the Relations of Engineering Science to Flood Control, by M. L. Cooke (pp. 40–47).

[Combating the forces of frost in Florida] E. S. Ellison. (U. S. D. A. and Fla. Expt. Sta.). (*Subtrop. Gard. and Fruit Growing, 1 (1938), No. 2, pp. 14, 15, 24, fig. 1*).—The history and mechanism of Florida freezes, and the theory and practice of grove heating are briefly reviewed. Effective grove heating is made possible by the relatively thin layer of cold air next the ground on clear, calm frosty nights which is usually overlain by a warmer stratum a few feet above the tree tops which acts as a roof to stop the ascent of the heated air. On rare occasions during the initial stage of the most severe freezes there is no temperature ceiling or its height is too great to be of much practical value. In such cases it is the direct radiation from the grove fires that prevents frost damage. Another very important factor in grove heating is the amount of air movement near the ground, and border rows of heaters are usually needed to protect trees on the windward side of the grove. Tests have shown that smoke from heaters has very little effect on the surface temperature in the grove.

Report of the committee on snow, 1937–38, J. E. Church et al. (Nev. Expt. Sta.). (*Amer. Geophys. Union Trans., 19 (1938), pt. 1, pp. 281–314*).—This is a report of the National Research Council's committee on snow for the period 1937–38, giving brief accounts of organization and personnel, progress of investigations in this field in the United States and other countries, and an extensive list of recent publications.

Western Interstate Snow-Survey Conference (*Amer. Geophys. Union Trans, 19 (1938), pt. 2, pp. 671–744, figs. 29*).—The following papers are included: The Expanded Program of the United States Weather Bureau in Snow-Work, by M. Bernard (pp. 673–685) (U. S. D. A.); Development of Snow-Surveying in California, by F. H. Paget (pp. 686–689); Establishing First-Year Normals on the Basis of Accumulated Snowfall and Some Forecasts From Runoff-Ratios, by R. C. Farrow (pp. 689–695); Winter Precipitation Versus Snow-Survey for Forecasting on Skagit River, Washington, by R. Leaver (pp. 695–702); Catch-Can Measurements Meet Power-Forecasting Requirements in Bishop-Mono Basins, by G. Wills (pp. 703, 704); Frost in the Soil a Suggested Factor Affecting Forecasts, by W. W. McLaughlin (pp. 704, 705) (U. S. D. A.); Symposium on Economic Aspects of Snow-Surveying, including Value of Snow-Surveying in the Tahoe-Truckee Basin, by G. G. Devore (pp. 705, 706), Economic Value of Snow-Surveying for the Los Angeles Aqueduct, by J. E. Phillips (pp. 706, 707), and Costs and Benefits of Snow-Surveying in Utah, by G. D. Clyde (pp. 707–711) (Utah Expt. Sta.); Improvement of Snow-Survey Equipment, Including Improvement in Ski, Duralumin Sampler, and Weighing Apparatus, by P. S. Cowgill (pp. 711, 712), Further Observations and Tests on Duralumin Sampler, by J. E. Church (pp. 713, 714) (Nev.), Attachment of Cutters and Couplings, Spanner-Wrenches, by J. T. Ryan (pp. 714–717) (Univ. Nev.), Snow-Course Markers, by R. S. Parshall (pp. 717, 718) (U. S. D. A. and Colo. State Col.), and The Stevens Seasonal Snow-Rain Recorder, by L. E. Rinker (pp. 718–720); and several papers on the relation of weather and snow to winter sports.

Report of the Chief of the Weather Bureau, 1938, W. R. GREGG (*U. S. Dept. Agr., Weather Bur. Rpt., 1938, pp. 15*).—This constitutes an administrative account of the work of the Weather Bureau during the fiscal year ended June 30, 1938, including a review of the weather during this period and a summary of data on droughts of recent years.

Meteorological observations, [1938], C. I. GUNNESS ET AL. (*Massachusetts Sta. Met. Ser. Buls. 589–600 (1938), pp. 4 each*).—These are the usual summaries of observations for each month at Amherst, Mass., with brief notes on the more significant features.

The December number contains an annual summary for 1938, which shows that the mean pressure for the year was 30.05 in.; the mean temperature 49.2° F. as compared with the normal of 47.2°, highest 93° August 3 and 15, lowest —12° January 19; total precipitation 59 in., as compared with the normal of 43.49 in.; snowfall 42.5 in., as compared with the normal of 48.38 in.; mean cloudiness 56.6 percent, bright sunshine 54.6 percent; last frost in spring May 31, first in fall September 10; last snow April 10, first November 14.

SOILS—FERTILIZERS

Mankind and the soil, P. KRISCHE (*Mensch und Scholle. Berlin: Deut. Verlagsgesell., 1936, pp. [7]+IV+151, figs. 289*).—This book, which is dedicated to the memory of C. F. Marbut, spoken of as the friend and supporter of the author's work, is made up largely of maps showing the history and geography of cultivated soils. These and their descriptive text are said mostly to represent articles which appeared during the years 1933–36 in *Die Ernährung der Pflanze.*

Principles of agronomy.—I, Soil dynamics, A. DEMOLON (*Principes d'agronomie. Tome I, La dynamique du sol. Paris: Dunod, 1938, 2. ed., pp. XIV+495, pls. 3, figs. [90]*).—As in the first edition (E. S. R., 71, p. 593), the author notes that this work is not a general treatise but is confined to internal dynamics of soils.

Part 1 deals in general with the formation and development of soils, containing chapters on general ideas concerning parent rocks and on paedogenesis and genetic classification. Part 2, under the caption of the physical medium, takes up general properties of disperse systems, the mineral colloids of the soil, the humic colloids, mechanical analysis, the structure of soils, soil-water relations, and soil climate. Part 3, on the chemical medium, deals with the chemical dynamics of a complex absorbent, the soil solution, soil reaction and other electroionic properties, and plant nutrients supplied by the soil. Part 4 is concerned with the soil as a biological medium, taking up the movement of the soil population, the biochemical evolution of the carbon of the soil, the biochemical evolution of the nitrogen and sulfur of the soil, and the fertility concept. An appendix deals briefly with methods of soil analysis.

[Soil Survey Reports, 1932, 1934, and 1935 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1932, No. 32, pp. 39, figs. 2, map 1; 1934, Nos. 10, pp. 55, figs. 3, map 1; 11, pp. 41, figs. 2, map 1; 1935, Nos. 2, pp. 42, pl. 1, figs. 4, map 1; 3, pp. 34, figs. 2, map 1*).—Except as indicated below, these surveys were made in cooperation with the respective State experiment stations: 1932, No. 32, Athens County, Ohio, A. H. Paschall et al.; 1934, Nos. 10, Williamson County, Tex., E. H. Templin et al., and 11, Hayes County, Nebr., L. A. Brown (Univ. Nebr.); and 1935, Nos. 2, Allen County, Kans., W. I. Watkins et al., and 3, Carteret County, N. C., S. O. Perkins et al. (N. C. Dept. Agr.).

Factors contributing to the reaction of soils and their pH measurement, W. T. McGeorge (*Arizona Sta. Tech. Bul. 78 (1938), pp. 93–126, figs. 10*).—The author shows that calcium carbonate, which has been generally considered to play no appreciable part in the alkalinity of alkaline calcareous soils, causes sodium-saturated clays to give a higher pH value than in the absence of carbonate. It is also shown that calcium carbonate can itself undergo sufficient active hydrolysis to affect plant growth and soil properties seriously, especially in heavy, poorly aerated soils.

It is further pointed out that pH determinations made on suspensions of soils in excesses of water permit a degree of hydrolysis never encountered under field conditions, an error which was eliminated by the use of a spear-type glass electrode at a moisture content about equal to the moisture equivalent of the soil. "It is further suggested by our investigations that since tap water closely approaches the average irrigation water in composition and is buffered similarly, pH values of much practical value may be obtained by using this water as a medium for the pH determination. Even black alkali soils show little change in pH with variation in the soil : water ratio when tap water is used."

When the replaceable sodium exceeded 10 milliequivalents and amounted to 20 percent or more of the exchange capacity, there was a straight-line relationship between replaceable sodium and pH. "pH is therefore a function of replaceable sodium in soils of high exchange capacity when sodium is present in sufficient amounts to dominate the system. In soils with exchange capacity below 10 m. e. we were unable to identify any single dominating factor. There is probably a conflict in such soils between calcium carbonate, sodium carbonate, replaceable sodium, and the soluble salts."

Further experiments pointed to the probably important significance of pK value determinations in the study of the properties of black alkali soils, and determinations of titration curves at or near the moisture equivalent of alkaline calcareous soils showed both that calcium carbonate contributes importantly to the buffer capacity of the soils and that far less acid is required to reduce the pH of an alkali soil to pH 7 at field-moisture content than at 1 : 10 dilution. "This proves that the reduction of pH in alkali soils is a much simpler operation than previous soil studies have indicated."

Surficial run-off and erosion in Java [trans. title], C. Coster (*Landbouw [Buitenzorg], 14 (1938), No. 8–9, pp. 457–572, pls. 19, figs. 5; Eng. abs., pp. 563–572*).—This monographic study (with 59 literature references) discusses the present state of the problem, the arrangements and methods of the studies reported, run-off in relation to the amount and intensity of the rainfall, and experiments on various Javanese soils. It is concluded that the run-off and erosion are determined in the main by one supreme factor, viz, the extent to which the mineral soil is laid bare. On a good forest soil the downflow is very small and there is no erosion. On denuding this soil the downflow increases to 30–50 percent, and the erosion to 5–12 kg per 1 sq. m per year. On loose sandy ashes the erosion may assume catastrophic proportions. The protective effects of the various forms of vegetation depend mainly on the extent to which the soil is covered by herbaceous growth and litter. A second factor is the formation of sods, which increases the surface run-off but counteracts erosion. Among the less favorable plant covers the author mentions tuft grasses, alang-alang, sod-forming bamboos and grass, and forest without undergrowth in the lowland plains where the litter rapidly disappears, denuding the soil. In the mountain forest without undergrowth the litter remains longer, allowing its favorable action. Whatever the vegetation, it is always entirely opposed to the primitive agriculture on slopes in a rainy climate where no soil-protecting measures are taken. After the first 2 yr. of annual cultivation the upper soil is very soon washed away and the land becomes barren. Intermittent agriculture with fallow periods of many years duration is not very harmful in the rainy tropical climate with its luxuriant growth, but the regular burning off, often inherent in this form of native agriculture, destroys the fertility of the soil. The terracing of rice fields in Java provides an ideal protection against erosion and floods.

Soils in relation to fruit growing in New York.—XIII, Seasonal fluctuations of soil moisture in some important New York orchard soil types, D. Boynton and E. F. Savage (*[New York] Cornell Sta. Bul. 706 (1938), pp. 36, figs. 30*).—The data here discussed indicate that a lack of soil moisture probably seldom limits the productivity of New York orchards on well-drained, relatively permeable orchard soils which permit rooting to a depth of 4 ft. They indicate also that low permeability coupled with poor drainage and the presence of bedrock at a shallow depth can be responsible for a direct lack of soil moisture and consequent low productivity of New York orchards.

The variation during the 1936 and 1937 growing seasons of soil moisture in 12 orchard plats located in western, central, and eastern New York on soil types of widely divergent physical characteristics was observed. In 1936 the rainfall in western and central New York was far below normal, while it was about average in the Hudson Valley. In 1937 the rainfall was either normal or above normal at all of the moisture plats. In general, the reserve of soil moisture on the western New York plats was sufficient during the dry season of 1936 to compensate for a rainfall deficiency of from 5 to 6 in., and to carry the orchards through two prolonged dry periods without serious consequences to the current or the subsequent crops. There appeared to be less available water in the top 3 ft. of the more retentive, less permeable, heavy-soil plats than in the top 3 ft. of the light-soil plats in western New York in both 1936 and 1937. The rooting area in one western New York plat on poorly drained, relatively impermeable, heavy soil was reduced to the permanent wilting percentage for a short time in the summer of 1936. Although the rainfall for the 1936 growing season in the Hudson Valley was about normal, a lack of rain for 2 weeks reduced the soil moisture to the permanent wilting percentage in one orchard plat on soil only 2 ft. deep.

This bulletin continues a series (E. S. R., 80, p. 195).

The effect of moisture changes on soil as a medium for bacterial growth, H. J. Conn and M. A. Darrow. (N. Y. State Expt. Sta.). (*Soil Sci., 46 (1938), No. 5, pp. 365–377*).—The five soil samples studied, if allowed to become air-dry, were impaired as media for growth of the test organisms, even after they were brought up to optimum moisture content and the necessary nutrients added to support bacterial growth. It proved possible to restore air-dry soil to its normal condition in this respect by holding it at 35 percent of its water-holding capacity for about 2 weeks before adding the bacterial nutrients, sterilizing, and inoculating with the test organisms. Experiments to show whether the improvement of the soil after moistening might be due to changes brought about in it by growth of the natural soil flora during the 2-week period while the soil was moist, or by release during this period of bases that might possibly have been fixed by the soil colloids while the soil was in an air-dry condition indicated that fixation of potassium might be one of the factors involved, "but results varied too greatly to be conclusive."

It is considered that "changes in the condition of the nutrients due to variations in the moisture level may well be more serious to bacteria, studied for a week or so after inoculation, than to plants which live months, usually through many changes in moisture conditions. This may explain one of the difficulties encountered in using micro-organisms to indicate plant nutrient deficiencies."

Interaction between carbonates and soils, A. N. and M. L. Puri (*Soil Sci., 46 (1938), No. 5, pp. 401–408, figs. 5*).—Experimental evidence indicating that soil acidoids and single-base soils behave like true acids and salts, respectively, in their reaction with carbonates of alkali and alkaline earths was obtained. The merits and limitations of the method of finding lime requirement of soils based on the reaction with $CaCO_3$ are discussed.

Oxidation-reduction potentials of arsenate-arsenite systems in sand and soil mediums, C. M. Keaton (*Wash. State Col. Res. Studies, 6 (1938), No. 2, pp. 99–101.*)—The redox potential of the arsenate-arsenite system in the pure quartz sand solution conformed with the theoretical formula, but in the two soils studied the clayey soil had a lower redox potential than the sandy soil and in the latter there was a greater tendency for arsenic to be present in the form of arsenate. In both soils arsenic was fixed by adsorption and combination, but it was observed that a higher percentage of arsenate than arsenite was fixed by these soils. The addition of iron to the system when the original ratio of arsenate to arsenite was unity increased the redox potential independent of the medium used. In the two soils studied the colloidal fraction possessed a greater reducing capacity and a lower potential than the soil from which it was extracted.

The chemical composition of soil from cultivated land and from land abandoned to grass and weeds, A. L. Prince, S. J. Toth, and A. W. Blair (N. J. Expt. Stas.). (*Soil Sci., 46 (1938), No. 5, pp. 379–389, figs. 2*).—It was found that after a period of 30 yr. of cultivation on the one hand and of abandonment to grass and weeds on the other, both nitrogen and carbon are now, without exception, higher in the uncultivated section than in the cultivated. The cultivated sections show a gradual depletion of their supply of nitrogen and carbon, "since there is comparatively little encouragement for volunteer leguminous plants to come in and restore nitrogen losses and the removal of the crops prevents the maintenance of the organic matter supply." Although the subsurface soils of both sections show lower percentages of both nitrogen and carbon than do the surface soils, the subsurface soils of the uncultivated section show higher percentages of these elements than do the subsurface soils of the cultivated section.

Where phosphorus and potassium have been applied, soil from the uncultivated section shows a slightly higher percentage of these elements than does soil from the corresponding plats of the cultivated section. In all plats, phosphorus is higher in the surface soil than in the subsurface soil, but the reverse is true for potash. In the uncultivated section, the pH values increase progressively with each 2-in. increase in depth, down to 6 in.; and the total nitrogen, carbon, and phosphoric acid decrease progressively. The higher pH values at the lower depths are attributed to the higher base saturation at these levels. Much of the phosphoric acid was found to be fixed in the top 2-in. layer; the larger amounts of the other constituents found in this layer are believed to be due largely to an accumulation of organic matter.

The cation exchange capacity of the uncultivated soils, which was greatest in the top 2 in., was found to be higher in every instance than that of the cultivated soils. The accumulation of the acidoid fraction (humus and phosphoric acid) in the upper layers of the uncultivated section is considered to account for this variation. The ultimate pH values are lowest on those soils in which there is the greatest accumulation of the acidoid fraction. The effects of leaching and of removal of exchangeable bases by cultivation were found to have lowered the content of exchangeable calcium, magnesium, and potash in the cultivated soils as compared with that of the uncultivated soils.

Chemical conservation of manure, C. J. Schollenberger (*Ohio Sta. Bimo. Bul. 195* (*1938*), *pp. 219, 220*).—The author believes, on the basis of economic considerations, that moist, compact storage with precautions against leaching, together with prompt covering with soil after spreading in calm, cool, moist weather, is to be preferred to conservation of nitrogen by the addition of chemicals. If acid peat moss is available for use as stable litter its ability to absorb ammonia and limit fermentation will result in lower losses than are usual with straw.

The effect of various nitrogenous fertilizers on soil factors affecting the yield of crops, F. L. Davis (*Louisiana Sta. Bul. 301* (*1938*), *pp. 22, figs. 3*).—The results of a source-of-nitrogenous-fertilizer experiment and of a general fertilizer test are reported. The soil reaction and available phosphorus content of plats fertilized for a period of 10 yr. with different sources of nitrogen are given.

Sodium nitrate and sodium-potassium nitrate produced more cotton than other sources of nitrogen. Without liming, the average relative yields for the 10-yr. period were as follows: Sodium nitrate 100, sodium-potassium nitrate 100, calcium nitrate 97, calcium cyanamide 91, urea 91, Ammophos 90, and ammonium sulfate 89.

After liming to a soil reaction of pH 6.8, Ammophos and ammonium sulfate produced yields of 111 relative to the yield from sodium nitrate as 100.

The continued use of acid-forming fertilizers caused an increase in soil acidity, with an associated decrease of soil bases, and a reduction of the availability of phosphorus. The reaction of the soil after 10 yr. of continuous fertilization with the same materials was as follows: Ammonium sulfate pH 5.5, no fertilizer check pH 5.6, Ammophos pH 5.6, no nitrogen check pH 5.7, ⅓ ammonium sulfate and ⅔ sodium nitrate mixed pH 5.8, urea pH 5.9, ½ sodium nitrate and ½ cottonseed meal mixed pH 6.0, calcium nitrate pH 6.0, calcium cyanamide pH 6.1, sodium-potassium nitrate pH 6.2, and sodium nitrate pH 6.4.

The largest quantities of available phosphorus resulted from the use of fertilizers containing calcium, namely, calcium nitrate and calcium cyanamide. Liming the ammonium sulfate and Ammophos plats, from pH 5.6 to pH 6.8, increased their content of available phosphorus relative to the other plats. A decrease in the availability of phosphorus was associated in general with increased soil acidity.

The yield of cotton was more closely related to the available phosphorus than to soil reaction.

Organic phosphates.—I, Fixation studies with three different soil types, G. E. Hilbert, L. A. Pinck, M. S. Sherman, and T. H. Tremearne. (U. S. D. A.). (*Soil Sci., 46* (*1938*), *No. 5, pp. 409–418, figs. 2*).—The fixation of glycerophosphate varied widely with the nature of the soil. In Cecil soil, about 40 percent colloidal matter, the organic phosphate was converted almost as rapidly and completely to an insoluble form as was inorganic phosphate. In Norfolk and Las Vegas soils, the percentage of organic phosphate immobilized increased as the time of contact of the organic phosphate with the soil increased. Very little increase in fixation of organic phosphate by sterilized Norfolk and Las Vegas soils took place in a contact time of from 3 to 24 days, thus supporting the view that the increase in fixation in raw soil is in the main a secondary reaction following the primary action of soil micro-organisms on the organic phosphate.

Granulated fertilizers, C. B. SAYRE. (N. Y. State Expt. Sta.). (*Amer. Fert., 86 (1937), No. 3, pp. 10, 11*).—In an experiment with fertilizer granulated to pass a 5-mesh screen but not a 10-mesh, as compared with powdered fertilizer passing a 40-mesh sieve, a 600-lb. broadcast gave increases of the tomato crop amounting to 1.9 tons per acre from the powdered fertilizer and almost 2.9 tons from the granulated. When the fertilizer was placed in bands 2.5 in. to each side and 3 in. deep, the powdered fertilizer increased the yield by 2.26 tons, the granulated by 3.03 tons. In a smaller scale experiment with 3 other fertilizer formulas similar results were obtained. The superior drilling properties of the granulated product are pointed out, together with the view that fertilizers are at least 50 percent more efficient when applied uniformly than when irregularly distributed.

Inspection and analysis of commercial fertilizers, B. D. CLOANINGER (*South Carolina Sta. Bul. 317 (1938), pp. 131*).—This bulletin gives for 1937–38 the usual analytical data.

AGRICULTURAL BOTANY

Plant physiology, with reference to the green plant, E. C. MILLER (*New York and London: McGraw-Hill Book Co., 1938, 2. ed., pp. XXXI+1201, figs. 39*).—"In the preparation of this edition, various topics have been enlarged or revised to include the investigations and findings that have been made since the publication of the first edition [E. S. R., 66, p. 319]."

Tree growth, D. T. MACDOUGAL (*Leiden, Netherlands: Chron. Bot. Co., 1938, pp. [3]+240, figs. 20*).—Following an introductory and historical section, this first of a new series of plant science books takes up, in order, the methods of measurement of tree growth, variations other than growth, the inception of growth and the seasonal activities in pines, the Monterey pine, elongation and radial growth in pines, life history of a pine tree, features of growth of bald cypress, larches, spruces, and Douglas fir, the Sequoias, diametral growth of older Sequoias, growth of *Cupressus macrocarpa* and of two allied dwarf species, diametral growth and differentiation of tissues in *Fraxinus*, *Ulmus*, *Acer*, *Platanus*, and *Fagus*, seasonal activities of oak trees, features of growth of *Juglans*, *Populus*, and *Salix*, growth of specialized types of trees (*Umbellularia*, *Arbutus*, *Parkinsonia*, *Phytolacca* and *Carnegiea*), seasonal elongation and cambial action in roots—correlations with growth of trunks, area of leaf surfaces, accumulation of surplus material and amount of wood formation, and incidental and experimental modifications of wood formation. Literature references follow the individual chapters.

Comparative morphology of the higher plants.—I, Vegetative organs, pt. 1, W. TROLL (*Vergleichende Morphologie der höheren Pflanzen. I. Band: Vegetationsorgane, I. Teil. Berlin: Borntraeger Bros., 1937, vol. 1, pt. 1, pp. XII+955, figs. 758*).—Following an introductory section, the subject matter of this part of the monographic work is taken up under the main headings of (1) the relationships of form in the higher plants, with their characteristics as displayed by specific examples, and (2) the structure of shoots and systems of shoots.

Proceedings of the fifty-first annual meeting of the Iowa Academy of Science, 1937. (Iowa State Col.). (*Iowa Acad. Sci. Proc., 44 (1937), pp. 104, 105*).—Abstracts of the following papers of botanical interest are included: The Strophiole in Sweet Clover and Alfalfa Seeds, by J. N. Martin; and The Vegetative Growth Phases of Apple Shoots and Their Relation to Root Formation, by V. T. Stoutemyer.

A new taxonomic arrangement of the orange subfamily Aurantioideae, W. T. Swingle. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 28 (1938), No. 12, pp. 530–533*).—The author presents a synopsis of the tribes, subtribes, and genera representing a new classification made possible by a prolonged and detailed study of all obtainable material of the 33 genera now included in the orange subfamily. A list of the new taxonomic entities is included.

The floral anatomy of the Aurantioideae, A. H. Tillson and R. Bamford. (Univ. Md.). (*Amer. Jour. Bot., 25 (1938), No. 10, pp. 780–793, figs. 49*).—This anatomical study included 94 species of 29 genera of this subfamily of the Rutaceae containing the citrus group.

Photosynthesis and the living state, O. L. Inman (*Science, 88 (1938), No. 2293, pp. 544, 545*).—From the studies here reported, the author concludes that the cells of some green plants may be disorganized and killed and yet retain for a short time some of their power to evolve oxygen on irradiation. However, it is believed very doubtful whether CO_2 absorption occurs so that a regular photosynthetic cycle is set up in such triturates. "This points to the fact that there is, after all, a close relationship existing between the whole mechanism of photosynthesis and the organized living green plant cell."

Complete or partial inhibition of flowering in certain plants when days are too short or too long, H. A. Allard. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 10, pp. 775–789, figs. 7*).—A number of plants were found to be intermediate in behavior, constituting a group whose flowering is favored by day lengths neither too short nor too long. On either side of this range flowering may cease, or be delayed or less profuse. *Mikania scandens*, *Phaseolus polystachyus*, and *Eupatorium torreyanum*, native plants of the eastern United States, all showed this intermediate flowering behavior, and a wild tropical sugarcane, *Saccharum spontaneum*, from New Guinea, designated 28 N. G. 292, exhibited the narrowest flowering response of any plant yet studied. Tests with daily light periods at 1-hr. intervals of 10–14 hr., and with full day length, revealed that flower buds were formed only when the plants were under 13 hr. of light each day, the flowering range therefore lying somewhere between a 12- and 14-hr. daily light period.

Wallace and Clum "leaf temperatures": A critical analysis with additional data, O. F. Curtis. (Cornell Univ.). (*Amer. Jour. Bot., 25 (1938), No. 10, pp. 761–771, fig. 1.*)—The author criticizes (with supporting data and discussion) the findings of Wallace and Clum (E. S. R., 79, p. 312), stating that "although the immediate effect of transpiration will invariably be to cool the transpiring tissue, its relative effectiveness in reducing the temperature or in preventing excessive heating has been greatly exaggerated. On the assumption that a leaf is absorbing 0.7 cal/cm^2/min., which is only 50 percent of that frequently incident on leaves exposed to the sun on clear days when there is greatest danger of overheating, transpiration must take place at the excessively high and unusual rate of 7.3 cc/d^2/hr. if transpiration is to dissipate the absorbed heat and merely keep the leaf from rising above air temperature. To lower the temperature of a leaf below that of the air when the leaf is in direct sunlight would seem to require impossibly high transpiration rates."

Translocation in plants, A. S. Crafts. (Univ. Calif.). (*Plant Physiol., 13 (1938), No. 4, pp. 791–814*).—Of the two theories of rapid longitudinal movement of solute molecules, this critical review (with 64 references) presents the case for mass flow, through sieve tubes or phloem, related, at least indirectly, to activity of photosynthetic tissues and not depending on the activity of the sieve-tube protoplasm, drawing attention to certain quantitative evidence and to cytological studies on the activity of sieve-tube protoplasm.

Migration of salts and water into xylem of the roots of higher plants, A. S. CRAFTS and T. C. BROYER. (Univ. Calif.). (*Amer. Jour. Bot., 25 (1938), No. 7, pp. 529–535, figs. 2*).—"The problem of salt migration in roots of higher plants as contrasted with accumulation by cells is posed, and a mechanism to explain solute migration, water movement, and root pressure is suggested. The various activities of the root are discussed, including oxygen supply, ion uptake, organic nutrient supply, water movement, and secondary movements of solutes. The relations of these factors to this mechanism are pointed out, and supporting evidence from the literature is cited. A mechanism depending upon an activity gradient, conditioned by environmental differences imposed upon the tissues by their very structure, seems best to explain observed salt migration in roots. Such a mechanism fits most of the data and is consistent with known root structure."

Salt tolerance of plants at various temperatures, S. M. AHI and W. L. POWERS. (Oreg. Expt. Sta.). (*Plant Physiol., 13 (1938), No. 4, pp. 767–789, figs. 3*).—In the germination and growth of plants under saline or alkaline conditions temperature is shown to be a dominant factor and should be considered in recommending certain crops for such soils. Of the plants tested strawberry clover proved the most promising resistant legume for salinity, followed by sweetclover and alfalfa. Except in the alkaline soil receiving sulfur and manure, *Astragalus rubyii* failed to grow well under the different salt concentration treatments used. Analyses indicated a marked improvement of sulfur treated over control plats of alkali or saline soils by restoration of Ca for Na in the exchange complex, an improved reaction, decreased salt concentration, higher level of N and organic matter, a tendency to increase the base exchange capacity, and useful water capacity or moisture equivalent. The yields obtained in the field corroborated the chemical results. The S-oxidizing power of reclaimed soil was much greater than that of virgin alkali soil. Various treatments increased the nitrate nitrogen.

The "minor elements": Their occurrence and function in plant life, with reference abstract bibliography, G. H. RIDDLE (*New York: F. A. Russo, 1938, pp. [250]*).—This monographic report contains a digest of a large number of technical releases relating to agronomy which are available in the literature, and especially concerning the minor elements, their occurrence in soil and in plants and their functions when used in the form of water-soluble salts, and including Soil Deficiencies and Plant Diseases, by G. V. Jacks and H. Scherbatoff,[3] reproduced in toto.

The stratigraphic distribution of selenium in the cretaceous formations of South Dakota and the selenium content of some associated vegetation, A. L. MOXON, O. E. OLSON, W. V. SEARIGHT, and K. M. SANDALS. (S. Dak. Expt. Sta.). (*Amer. Jour Bot, 25 (1938), No. 10, pp. 794–809, figs. 4*).—Selenium is said to occur in all cretaceous formations of South Dakota, and the details of its content and distribution in the various strata are presented and discussed. Factors determining the selenium content of vegetation are also discussed, and a list of the more important seleniferous plants in the State is given. Analyses of vegetation collected on the various geological formations indicated a close relationship between the formation, the type of vegetation, and its selenium content. Seleniferous formations themselves capable of producing vegetation or readily breaking down to soils which will support vegetation were found to be important in the selenium poisoning of livestock.

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[3] Imp. Bur. Soil Sci. [Harpenden], Tech. Commun. 31 (1934), pp. 46.

Are there different critical oxygen concentrations for the different phases of root activity? D. BOYNTON, J. DEVILLIERS, and W. REUTHER. (Cornell Univ.). (*Science, 88 (1938), No. 2294, pp. 569, 570*).—Recent investigations with apple roots (field and greenhouse) indicate that there may be different critical oxygen concentrations for the subsistence, new-root initiation, existing root-tip growth, and absorption-accumulation phases of root activity.

Diurnal fluctuation in root pressure, K. A. GROSSENBACHER. (Univ. Calif.). (*Plant Physiol., 13 (1938), No. 4, pp. 669–676, figs. 4*).—In this study, *Helianthus* plants grown in culture solutions with forced aeration in the greenhouse were transferred to a thermostatically controlled darkroom where pressures were recorded at short intervals under constant conditions of light, temperature, and aeration. One of the most pronounced effects noted was a diurnal fluctuation in pressure which could not be correlated with any environal change during the test period. It is concluded that these plants were capable of maintaining a diurnal cycle in root pressure possibly controlled by a physiological cycle set-up during the growth period in the greenhouse. In view of this diurnal cycle and other considerations it is believed that root pressure cannot be explained simply by the difference in osmotic values of the xylem sap and the external solution, but must be caused by some other forces in the root system which control and activate this movement. "Evidently the mechanism of the diurnal cycle is in some way related to the mechanism responsible for root pressure." Though there is a relation between root activity and respiration, the diurnal cycle of root pressure showed no such correlation. Various authors have concluded that in potential growing tissues there is "positive water secretion" from the protoplasm into the vacuole in addition to the "osmotic pressure of the vacuole." In root pressure it is believed probable that some such force may operate in either direction and will, in addition to the osmotic forces involved, determine the pressure.

Foliar diagnosis: Its relation to the optimum nutrition of the potato, W. THOMAS. (Pa. Expt. Sta.). (*Plant Physiol., 13 (1938), No. 4, pp. 677–694, figs. 7*).—The author's previous studies (E. S. R., 79, p. 23) have been extended to other plats of the station's vegetable fertility tests treated with rotted horse manure, and also with complete fertilizers differently equilibrated. The indications given by the two methods of graphic representation are described in detail, and the foliar diagnosis of all plats is compared with that of the optimum (manure) plat. The intensity of nutrition (mean) and the composition of the mean NPK unit of the fourth leaf of potato plants growing in the manure plat were 10.35 and 65 : 5.72 : 29.3, respectively. This intensity and composition of the NPK unit is tentatively regarded as being near the optimum for the potato (Rural Russet variety) in this year.

Plant growth hormones, K. V. THIMANN and J. BONNER (*Physiol. Rev., 18 (1938), No. 4, pp. 524–553*).—This analytical review (with 200 literature references) discusses methods, the auxins and their action, formation of auxins in the plant, auxin inactivation, the effects of auxin on growth, factors other than auxin important for growth, and the mechanism of auxin action.

Intercellular wound hormones from ultraviolet injured cells, J. R. LOOFBOUROW, C. M. DWYER, and M. N. MORGAN (*Studies Inst. Divi Thomae, Athenaeum Ohio, 2 (1938), No. 1, pp. 137–153, figs. 3*).—The production of wound hormones, stimulating proliferation, by ultraviolet irradiation of yeast (*Saccharomyces cerevisiae*) was confirmed by a more quantitative method, and drying at 65° C. or autoclaving at 20 lb. for 15 min. had no measurable effects on the potencies of the materials. The yields in growth units per gram of yeast in suspension were 16–90 times as great in filtrates from irradiated as from nonirradiated suspensions. The evidence is believed to indicate that the wound hormones are substances released from the cells into the intercellular fluid as a physiologic response to injury rather than cellular destruction products. The most potent intercellular wound hormone preparations are said to be more potent than crude "bios" preparations made by Narayanan's method (E. S. R., 63, p. 708) and to have measurable activity by the methods used in concentrations of 8γ per cubic centimeter (1:125,000). There was no evidence of a decrease in the relative stimulating effect at concentrations as high as 1:175.

Effects of auxin on rates, periodicity, and osmotic relations in exudation, F. Skoog, T. C. Broyer, and K. A. Grossenbacher. (Univ. Calif.). (*Amer. Jour. Bot., 25 (1938), No. 10, pp. 749–759, figs. 7*).—In *Pisum* seedlings auxin was found to increase both the rate and duration of exudation, and its effect was modified by an accompanying influence on bud inhibition. In *Helianthus* the stimulating effect was mainly on the rate of exudation. The rates of exudation and electrolytic concentrations of the exudates were greatly influenced by the salts supplied to the external solutions, but the ratios of exudation rate to concentration difference between the exudates and the external solutions varied over a wide range and were increased by the presence of auxin. Indirect evidence suggested that auxin acts in conjunction with the utilization of food required for continued exudation, but nonelectrolyte solutes appeared to play only a minor role directly in exudation and no correlation was obtained between auxin activity or diurnal cycles in exudation and total respiratory rates. The effect of applied auxin is said to be exerted in the mechanism responsible for the diurnal periodicity in exudation shown to be exhibited by *Helianthus*, and it is greatest during the periods of increasing bleeding rates.

Nicotinic acid and the growth of isolated pea roots, F. T. Addicott and J. Bonner (*Science, 88 (1938), No. 2294, pp. 577, 578, fig. 1*).—Combination of nicotinic acid with vitamin B_1 or with the latter and an amino acid mixture resulted in a steady increase of the growth rate. From the data presented it appears possible that the amino acid mixture is not essential to continued optimal growth of isolated pea roots. However, nicotinic acid must apparently be regarded as a factor quite as significant as vitamin B_1 has proved to be, and its promotive influence on the shoot growth of the isolated pea embryo must also probably be attributed to its effect on the growth of the root.

Viability of cells containing chloroplasts with an optically homogeneous or granular structure, E. Weier. (Univ. Calif.). (*Protoplasma, 31 (1938), No. 3, pp. 346–350*).—Homogeneous and granular chloroplasts were found in 21 plant species, including tobacco and alfalfa. In general, granular chloroplasts were found in young leaves and in plants growing in the shade, while in older leaves and plants growing in the sun they were homogeneous. The viability of cells containing both types of chloroplasts was demonstrated as these cells accumulated neutral red. Both types reduced $AgNO_3$, and elaborated and hydrolyzed starch. Very short treatments with fumes of chloroform, toluene, formaldehyde, and pyridine killed the leaves and induced cessation of these activities.

Ice formation and the death of plant cells by freezing, I. H. Stuckey and O. F. Curtis. (Cornell Univ.). (*Plant Physiol., 13 (1938), No. 4, pp. 815–833, fig. 1*).—With water or sap on the outer cell surface the formation of ice obscures what is going on inside the cell. A technic is described for direct microscopical observation of the freezing of living cells without this water film by mounting in paraffin oil. Using this method the streaming was seen to become slower and finally to cease as the temperature of the stamen-hair cells of *Zebrina pendula* was lowered, and for a few seconds after streaming stopped Brownian movement was visible. Ice formation occurred at about —7° C., appearing first in the basal cells and advancing to the tip. The ice crystals were uniformly granular. In *Polypodium aureum* prothallia, needlelike crystals were occasionally formed, but usually the granular type. Freezing occurred cell by cell, or by a wave of crystallization sweeping across the field. Insofar as could be determined ice was formed first in the cytoplasm, then in the vacuole, and lastly in the plastids. On thawing, the surface membrane had lost its semipermeability, allowing droplets of cell sap to collect in the mounting medium. The cytoplasm became granular and disintegrated, and the nucleus assumed a glassy appearance.

Seeds of Minhardi and Leap wheat were more resistant to freezing temperatures when the water content was low. In microscopic freezing tests ice formation was found in seeds with high water and poor germination, and lack of ice in those with low water and good germination. Leaves from nonhardened wheat showed ice formation at —10° to —12°, while hardened leaves resisted ice formation down to —25°. Death always followed ice formation in the cells. Sucrose failed to protect strips of red cabbage epidermis from the injurious effects of ice in the protoplast. When the cells were partially plasmolyzed by the solution before freezing, a lower temperature was required for ice formation.

The present evidence and the observations of others are believed to suggest strongly that death of plant tissues by freezing occurs through the mechanical injury induced by ice formation within the cells. Anything decreasing the amount of free water within the cell at the time of freezing will probably decrease the possibility of ice formation and thus increase the cell's resistance to freezing temperatures.

A study of the mechanism of frost injury to plants, D. Siminovitch and G. W. Scarth (*Canad. Jour. Res., 16 (1938), No. 11, Sect. C, pp. 467–481, pls. 2, figs. 3*).—Two modes of freezing, intracellular and extracellular, were indicated by observations on isolated cortex tissues of hardy and nonhardy *Catalpa* and *Cornus* and on red cabbage epidermis in a micro-freezing apparatus. In intracellular freezing, ice crystals formed first in the protoplasm and then in the vacuole, while in the extracellular type ice formed outside the cells from water in the cells, the resulting dehydration causing cellular collapse. Intracellular freezing is said to be fatal to all cells by visible mechanical destruction of the protoplasm and vacuole. It is facilitated by rapid freezing and occurs less easily and frequently in hardy tissues and in trees and shrubs than in nonhardy and herbaceous tissues. Extracellular freezing induced through slow cooling is fatal to all nonhardy cells in trees and herbs at all temperatures below the freezing point and to cells of hardy cabbage only at —10° to —15° C., but not to cells of hardy trees and shrubs. Both types of ice formation were observed in intact plants of red cabbage frozen in a refrigerator. The behavior of hardened plants indicates that intracellular freezing tends to be prevented therein by an increased permeability to water. For extracellular freezing, a mechanical injury hypothesis is presented, based on the behavior of the cells on freezing and in micrurgy.

The effect of certain variables upon the freezing point depression of plant tissues, P. Zimpfer (*Ohio State Univ., Abs. Doctoral Diss., No. 26 (1938), pp. 67–73*).—This is an abstract of the results of a study in which the temperatures were determined by a copper-constantin thermocouple system, using three distinct types of tissues, viz, tubers and stems of potato and leaves of *Echeveria weinbergii.* The freezing curves obtained with the various tissues, alive and dead, and of the expressed sap are presented, differences in freezing points of live and dead tissues are noted, and the heat evolution during freezing of live and dead tissues is discussed. The tissue method is considered probably valid for indicating comparative osmotic pressures in different samples of the same tissue, but can not be looked upon as giving absolute values.

Method for "fixing ice crystal patterns" in frozen products, J. G. Woodroof. (Ga. Expt. Sta.). (*Science, 89 (1939), No. 2300, p. 87*).—For microscopic studies of fruits and vegetables preserved by freezing, a rapid and satisfactory method of sectioning was developed in which 18°–20° F. was found to be the most suitable temperature. By this method ice crystal patterns could be fixed, measured, and photographed very accurately as a prelude to establishing a means of evaluating methods of freezing these products.

Heritable variations in chlorophyll, J. C. Ireland. (Okla. Expt. Sta.). (*Plant Physiol., 13 (1938), No. 4, pp. 863–865, pl. 1*).—A spectrographic record of chlorophyll extracts is offered to replace the uncertain terms used to describe the degrees of greenness of leaves of grain sorghums in making inheritance studies. The spectrographic variations in the chlorophyll extracts of grain sorghums were continuous throughout a season and in two generations. The concentration of chlorophyll and of sugars did not correlate with the widths of spectrographic bands.

Techniques for the isolation of single microorganisms, E. M. Hildebrand. (Cornell Univ.). (*Bot. Rev., 4 (1938), No. 12, pp. 627–664*).—This comprehensive review (149 literature references) considers the pure-culture concept; pure culture by dilution, semimechanical, and mechanical methods, with discussion of the relative merits and applications; and the isolation of single micro-organisms with the Chambers micromanipulator by the modified Barber method.

The method of electrical conductivity in studies on bacterial metabolism, J. B. Allison, J. A. Anderson, and W. H. Cole. (Rutgers Univ.). (*Jour. Bact., 36 (1938), No. 6, pp. 571–586, figs. 4*).—The specific conductivity was found to be directly proportional to ammonia production by *Pseudomonas fluorescens* grown in skim milk and by *Achromobacter lipidis* n. sp. grown on 1 percent peptone medium. Measurements on skim milk inoculated with *Lactobacillus odontolyticus* demonstrated that specific conductivity is a linear function of decreasing pH until the isoelectric point of the casein is reached. A constant specific conductivity is approached rapidly if the curd precipitates around the electrodes, while the approach is slower if a colloidal gel is formed.

The demonstration of phage precursor in the bacterial cell, A. P. Krueger and J. H. Mundell. (Univ. Calif.). (*Science, 88 (1938), No. 2293, pp. 550, 551*).—In this preliminary report the authors state that phage precursor is produced by the actively metabolizing bacterium and apparently is present on the cell surface. Its production is enhanced by conditions favoring general cell metabolism, it is transformed into phage within 2–4 min. after addition of phage to activated cell suspensions, and it is more thermolabile than the bacterial cell.

Root nodule bacteria of some tropical leguminous plants.—II, Cross-inoculation tests within the cowpea group, O. N. and E. K. Allen. (Hawaii. Pineapple Producers' Expt. Sta.). (*Soil Sci., 47 (1939), No. 1, pp. 63–76*).—Continuing this series (E. S. R., 76, p. 770), a study was made of the morphological and physiological characteristics of 54 strains isolated from 28 leguminous hosts in Hawaii. Cross-inoculation tests on 20 plant members of the cowpea group indicated marked variations in infectiveness and effectiveness of these rhizobia, and only 25 percent of the strains produced nodules on all the test plants. As to the effects of inoculation, 89 percent of the strains proved to be beneficial on more than 10 plant species, and 4 strains were beneficial on 19 species. Ten of the test plants were nodulated by all sources of inocula. *Vigna sinensis* was the most susceptible, since each strain not only produced nodules but enhanced its growth. The other extreme was represented by *Phaseolus lunatus* on which 22 strains produced nodules, none of which were beneficial. It seems clear that variations in the infectiveness and effectiveness of rhizobia from plants of the cowpea group may be of greater magnitude than those recorded for the other cross-inoculation groups.

Species of Cladosporium on tomato and the allergic response in man as an aid to their identification, E. F. Guba and F. M. Rackemann. (Mass. Expt. Sta.). (*Mycologia, 30 (1938), No. 6, pp. 625–634, fig. 1*).—The taxonomy and characterization of species of *Cladosporium*, especially those occurring on tomatoes, are discussed. Data are presented indicating that individuals allergic to fungi show strong differences to extracts of species in the same genus and that this biologic test appears to offer another method for differentiating closely related fungus species with considerable certainty.

Fasciation in the sporophores of Clitocybe tabescens, A. S. Rhoads. (Fla. Expt. Sta.). (*Mycologia, 30 (1938), No. 6, pp. 681, 682, fig. 1*).—The fasciated sporophores described occurred at the base of an old rotted oak stub.

A study of spore formation and other morphological characteristics of Vibrio desulfuricans, R. L. Starkey. (N. J. Expt. Stas.). (*Arch. Mikrobiol., 9 (1938), No. 3, pp. 268–304, figs. 16*).—The author presents the results of a morphological and life history study of this bacterium isolated from sewage, mud, and soil, and the influence of environal factors, particularly temperature. This is believed to be the first decisive evidence of the production of endospores by vibrio-shaped rods. Consequently the new genus *Sporovibrio* is proposed, with the type species *S. desulfuricans* n. comb. It is suggested that morphological changes of similar nature to those described may possibly be induced in other bacteria by modifying the cultivation temperatures.

Fumaric acid formation associated with sexuality in a strain of Rhizopus nigricans, J. W. Foster and S. A. Waksman. (N. J. Expt. Stas.). (*Science, 89 (1939), No. 2298, p. 37*).—This preliminary note concerns a strain of *R. nigricans* whose female and male races are distinct by virtue of the possession and complete lack, respectively, of the enzyme system by which the organism produces fumaric acid when grown on a glucose-mineral solution.

The status of Septoria graminum, R. Sprague. (U. S. D. A. and Oreg. and Wash. Expt. Stas.). (*Mycologia, 30 (1938), No. 6, pp. 672–678, figs. 5*).—Data from the literature and herbarium collections are reviewed, and the synonymy and an emended description of *S. graminum* are presented.

The effect of galactose on the growth of certain fungi, A. E. Edgecombe (*Mycologia, 30 (1938), No. 6, pp. 601–624, figs. 10*).—In view of the marked unfavorable responses of green plants to galactose, this study was made to determine whether similar effects would be found in nonchlorophyllous plants, six representative fungus species (*Phytophthora cactorum, Saprolegnia ferax, Sclerotinia cinerea, Physalospora cydoniae, Alternaria solani,* and *Sclerotium rolfsii*) being tested against basic media containing galactose, glucose, sucrose, and starch, respectively. The results of these studies and data from the literature incline the author to believe that nongreen plants are less susceptible than green plants to the inhibiting effect of galactose, and that it is not toxic to nongreen plants as it appears to be to the roots of green plants. Furthermore, as a source of carbohydrate galactose is somewhat less available and less readily absorbed by nongreen plants than glucose. The bases of the different reactions of green and nongreen plants to galactose are briefly discussed.

GENETICS

Statistical methods for research workers, R. A. Fisher (*Edinburgh: Oliver & Boyd, 1938, 7. ed., rev. and enl., pp. XV+356, figs. 12*).—A revised edition of the book previously noted (E. S. R., 76, p. 575), taking account of the newer advances in the statistical treatment of experimental data.

The measurement of linkage in heredity, K. Mather (*London: Methuen & Co., [1938], pp. IX+132, figs. 2*).—A presentation of methods for calculating linkages and heterogeneity in plant, animal, and human heredity.

[Plant genetics research] (*Genetics, 23 (1938), No. 1, pp. 140, 141, 144, 145, 147, 148, 149, 150, 152, 153, 154, 156, 157, 159, 161, 162, 163, 164, 165, 170, 171, 176*).—Papers presented at the 1937 meetings of the Genetics Society of America and published in abstract form included Induction of Polyploids in *Datura* and Other Plants by Treatment With Colchicine, by A. F. Blakeslee, A. G. Avery, and J. L. Cartledge; The Present Status With Regard to Segmental Arrangements in *Oenothera*, by R. E. Cleland; Mutations in the Pineapple, *Ananas Comosus* (L) Merr, and The Origin and Breeding Characteristics of Polyploid Pineapples, *Ananas comosus* (L) Merr, both by J. L. Collins and K. R. Kerns (both Univ. Hawaii); Natural Mutation Rate in Corn, by H. C. Eyster; A Comparison of X-Ray Inactivation Rates in *Drosophila* and in Tobacco Mosaic Virus, by J. W. Gowen, and Maternal Influence in the Heredity of Tillering in Maize, by E. W. Lindstrom (both Iowa State Col.); Species Formation and Polyploidy Within the Apomictic Genera *Rubus* and *Taraxacum*, by Å. Gustafsson; Chromonema and Chiasma Studies in Asynaptic, Desynaptic, and Normal *Trillium erectum*, by C. L. Huskins, A. W. S. Hunter, H. B. Newcombe, and G. B. Wilson; Variegation Resulting From Unequal Mitosis, by D. F. Jones (Conn. [New Haven] Expt. Sta.); The Photoperiod as a Factor in Sex Organ Inception in Flowers, by W. F. Loehwing; A Cytogenetic Study of White Chaff Off-Types Occurring Spontaneously in Dawson's Golden Chaff Winter Wheat, by R. M. Love; A Method for Detecting Potential Mutations of a Specific Chromosomal Region, by B. McClintock (Univ. Mo.); Action of Colchicine on Mitosis, by B. R. Nebel and M. L. Ruttle (N. Y. State Sta.); On the Origin of a Secondary Trisome Through the Doubling of a Half-Chromosome Fragment, by M. M. Rhoades, and The Use of Prime Types in Linkage Studies in the Soybean, by L. F. and G. S. Williams (both U. S. D. A.); Interlocked Bivalents as a Cause of Polyploid Pollen Grains, by H. P. Riley; Chromosome Behavior in Triploid *Datura stramonium*.—III, The Seed, by S. Satina, A. F. Blakeslee, and A. G. Avery; and On the Possibility of Disentangling by Spectrological Means the Complex of Genetic Effects Induced by Radiations, by L. J. Stadler, and Preliminary Data on Genetic Effects of Monochromatic Ultraviolet Radiation in Maize, by L. J. Stadler and F. M. Uber (both U. S. D. A. and Univ. Mo.).

Cytogenetic evidences of Nicotiana phylesis in the alata-group, P. Avery (*Calif. Univ. Pubs. Bot., 18 (1938), No. 7, pp. 153–194, figs. 13*).—*N. alata, N. bonariensis, N. langsdorffii, N. longiflora*, and *N. plumbaginifolia*—possessing certain morphological characters in common, having a distinct center of distribution, producing intragroup F_1 hybrids some of which are fertile or partially so, and distinguishable from other *Nicotiana* species by chromosome number and morphology—are considered as a phylogenetic unit (alata group) within the genus. Low numbers of chromosomes, distinctions in their number and morphology, and multivalent formation in the F_1 hybrids are said to make possible the study of speciation mechanisms in *Nicotiana*.

"The nature of the karyotype serves to subdivide the species of the alata group, *N. longiflora* and *N. plumbaginifolia* forming a 10-paired section and

N. alata, *N. bonariensis*, and *N. langsdorffii* a 9-paired section. In the 10-paired species all the chromosomes are of one morphological type. In the 9-paired species the basic karyotype consists of four morphologically distinct types of chromosome, the genoms of the three species showing visible differences from one another. Bivalent configurations and chiasma frequencies in four of the species were found to be determined by the position of the insertion region and the length of the arms of the chromosomes concerned. A high degree of chromosome conjugation occurs in six of the seven intragroup F_1 hybrids investigated, multivalents as well as bivalents usually being formed. The occurrence of these multivalents, consisting of three to seven chromosomes, indicates that although the species differ in genic organization their basic genic constitution is similar. In the hybrids between 9-paired species the formation of units larger than bivalents depends not only on the size of regions involved in reorganizations, but also on the lengths of the arms of the chromosomes in which they are located In hybrids between 9- and 10-paired species the occurrence of heteromorphic bivalents and trivalents indicates homology between shorter chromosomes with subterminal insertion region in the 10-paired species and one arm of large chromosomes with median insertion region in the 9-paired species.

"Evidence suggesting that the 10-paired species may have been derived from a 9-paired ancestral stock, and the roles which gene mutation and chromosome reorganization appear to have played in the differentiation of the species of the alata group, are discussed."

A Saccharum-Zea cross, E. K. JANAKI AMMAL (*Nature* [*London*], *142* (*1938*), *No. 3596, pp. 618, 619, fig. 1*).—A single seedling, said to be the progeny of male sterile Vellai sugarcane (*S. officinarum* $2n=80$) × Golden Beauty corn (*Z. mays* $2n=20$), was a dwarf resembling sugarcane but with the characteristic epidermal hair found on the upper leaf surface of corn. The plant had received the expected 40 chromosomes from the sugarcane parent and 12 chromosomes from the corn parent, among which the VI nucleolar chromosome of *Z. mays* was recognizable.

Linkage of the Q B Gs group in sorghum, J. C. STEPHENS and J. R. QUINBY. (U. S. D. A. and Tex. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *57* (*1938*), *No. 10, pp. 747–757, fig. 1*).—The sorghum linkage group of three pairs of genes, *Qq* (reddish v. blackish plant color), *Bb* (presence v. absence of nucellar layer), and *Gsgs* (normal green v. green-striped plants), was studied in the F_2 coupling phase. Each of these pairs showed complete dominance in F_1 and simple 3 : 1 segregation in F_2. The observed order of genes and cross-over percentages was *Q* (13.2) *B* (11.3) *Gs*. This linkage group was found independent of *Ss* (presence v. absence of spreader), *Rr* (colored v. white seed), *Aa* (awnless v. awned lemmas), *Dd* (dry v. juicy stalks), *Rsrs* (red v. green seedling stems), *Alal* (normal v. antherless flowers), *Wxwx* (starchy v. waxy endosperms), V_2v_2 (green v. virescent yellow seedlings), and *Tsts* (twin-seeded v. single-seeded spikelets).

Linkages in sorghum in which cross-over percentages were determined, reported by others, included *Rsrs* and *Ww* (green v. albino seedlings) 41.34 percent, and *Wxwx* and Y_2y_2 (green v. lethal yellow seedlings) 26.5 percent (E. S. R., 66, p. 22) ; and *Pp* (purple v. brown leaf sheaths) and *Dd* 30 percent (E. S. R., 78, p. 29).

The inheritance of scab resistance in certain crosses and selfed lines of potatoes, C. F. CLARK, F. J. STEVENSON, and L. A. SCHAAL. (U. S. D. A.). (*Phytopathology, 28* (*1938*), *No. 12, pp. 878–890, figs. 3*).—The genetic behavior of resistance and susceptibility to common scab was studied in a number of crosses and selfed lines. Green Mountain apparently breeds true for susceptibility to scab. Katahdin is susceptible, but carries at least one factor for scab resistance in a heterozygous condition. Hindenburg and Ostragis are probably homozygous for resistance, and seedling No. 44537 and Richter Jubel are heterozygous. There is a genetic linkage between russeting and resistance. In one cross the genes for scab reaction were independent of those for red and white tuber colors. Highly resistant russet-, red-, and white-skin types were produced, and a number of seedling varieties of the last type approach the commercial varieties in vigor and yield but are inferior in other characters. It is believed, however, that by using these resistant sorts as parents, and by selfing, sib-mating, and backcrossing, new varieties superior to the common commercial varieties can be produced.

The inheritance of reaction to physiologic races of Tilletia tritici (Bjerk.) Wint. in a winter wheat cross, A. M. Schlehuber. (U. S. D. A. and Wash. Expt. Sta.). (*Wash. State Col. Res. Studies, 6 (1938), No. 2, pp. 75–96, figs. 3*).—White Odessa wheat proved to be highly susceptible and Turkey-Florence highly resistant to the Ft–4 physiologic race of *T. tritici*. In 108 F_3 families neither reaction of these two varieties was recovered, as indicated by studies of the F_4 from extremes of resistant and susceptible F_3 lines. The exact number of genes controlling resistance to Ft–4 could not be determined, but at least four, all cumulative in effect, would be needed to explain the results. Both varieties proved moderately susceptible to the Ridit *tritici* bunt race. Of the F_3 families, ±18.75 percent were more resistant than White Odessa and 18.75 percent more susceptible than Turkey-Florence. It is assumed that White Odessa has the constitution *AABB*, causing its plants to fluctuate around a mean of 56 percent bunt, and Turkey-Florence *aabb*, causing a fluctuation around 76 percent. The F_3 families segregated according to the following Mendelian ratio: 9 like White Odessa and 3 more resistant, and 3 more susceptible than Turkey-Florence and 1 like it. There was close agreement between the calculated mean percentage of bunt in all F_3 families and that actually obtained. Transgressive inheritance in reaction to Ridit *tritici* was definitely proved by testing several F_4 lines.

The coefficient of correlation between the reaction of 76 F_3 families to Ridit *tritici* and a mixture of Ft–4 therewith was 0.726±0.037, the *r* value between Ft–4 and the mixture 0.233±0.073, and that between Ft–4 and Ridit *tritici* —0.071±0.071. It is suggested on the basis of these correlations that the resistances to the two bunt races are controlled by entirely different genes. The high correlation between Ridit *tritici* and the mixture is said to indicate that resistance to the mixture is largely controlled by the factors governing resistance to Ridit *tritici*. Since the reaction to Ft–4 is controlled by at least four factors and that of Ridit *tritici* by two, it is assumed that at least six genes are operative in resistance to their mixture.

The relation between stomata counts and chromosome number, H. J. Sax (*Jour. Arnold Arboretum, 19 (1938), No. 4, pp. 437–441*).—"The number of stomata per square millimeter of leaf surface was determined from herbarium material for a number of genera of trees and shrubs in which the chromosome number was known. With some exceptions, there was a positive correlation between stomata counts and chromosome number. Stomata frequency could not be used as an absolute index to polyploidy, but it would be suggestive of polyploidy in many cases, and it would prove very helpful in a preliminary survey of herbarium material."

Chromosome number relationships in the Leguminosae, H. A. Senn (In *Bibliographia Genetica. 's Gravenhage (The Hague): Martinus Nijhoff, 1938, vol. 12, pp. 175–345, figs. 104*).—"The present study of the Leguminosae is an outgrowth of a more intensive study of the karyological, morphological, and taxonomic relationships of the genus *Lathyrus*, the results of which will be published elsewhere. This study is intended to explore the karyology within the family and to suggest therefrom certain tentative phylogenetic and taxonomic rearrangements. Simultaneously a survey of this sort suggests certain further problems, the solution of which may clarify particular generic and specific lines."

A 12-page bibliography and an author-subject index are included.

Colchicine and its place in fruit breeding, B. R. Nebel and M. L. Ruttle (*New York State Sta. Circ. 183 (1938), pp. 19, figs. 10*).—Stressing the fact that colchicine is not a magic key to the solution of all genetic problems, the authors present information on chromosomes and their function, the numbers of chromosomes in cultivated fruits, and the relation of colchicine to plant breeding, particularly that of fruits.

Blood composition in sheep and their hybrids with Ovis polii karelini (Sev.) in connection with the power of acclimatization, H. F. Kushner and O. N. Kitaieva (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 20 (1938), No. 1, pp. 47–52*).—In attempting to produce a new breed of sheep combining fine wool production and adaptation to high altitude, Merinos were crossed with the *O polii karelini* (Kirghiz). Analyses of the hemoglobin, number and size of erythrocytes, and blood alkalinity were made and correlated with body size. The blood indexes of the hybrids were considerably higher at all ages than those of the local fat-tailed sheep (Kirghiz) and the Merinos. A high oxidative capacity of the blood was associated with the high blood indexes. It seems evident that the hybrids possess good physiological qualities for adaptation to high altitudes.

The genetics of the pig, A. D. Buchanan Smith, O. J. Robison, and D. M. Bryant (In *Bibliographia Genetica. 's Gravenhage (The Hague): Martinus Nijhoff, 1938, vol. 12, pp. 1–160, figs. 21*).—A summary is presented of results of studies of the genetics of the pig, dealing with chromosome numbers; the mode of inheritance of color, hair, and skin; physiological, sex, and morphological characteristics; and the methods of improvement of productive qualities in operation in the more important swine-producing countries.

Abnormal fore-toe as a new hereditary character in guinea pigs [trans. title], F. Kröning (*Biol. Zentbl., 58 (1938), No. 5–6, pp. 268–272, figs. 2*).—Various abnormalities involving one or more toes of the front feet occurred in guinea pigs in inbred lines. The expression of this condition was most variable, but in crosses with other strains it frequently seemed dominant.

Differences in the developmental ability of F_1 mice after the spermatogonia and fertile and infertile spermatozoa were X-rayed [trans. title], P. Hertwig (*Biol. Zentbl., 58 (1938), No. 5–6, pp. 273–301, figs. 8*).—Immediately after the testicles were X-rayed, sufficient fertile sperm were available for four or five matings over a period of from 1 to 8 days. Eleven days after irradiation all the germ cells were infertile, and histological studies showed the germinal tissue of the tubules to be completely degenerated. Litter sizes of the matings soon after irradiation were larger than those later, but after regeneration occurred fertility was normal. No effect from X-raying the sperm was evident except when lethal.

The physiology of cold blackening in Russian rabbits.—III, The regulation of ferment production by the gene a_n during the cooling phase [trans. title], R. Danneel and K. Schaumann (*Biol. Zentbl., 58 (1938), No. 5–6, pp. 242–260, fig. 1*).—Continuing this series (E. S. R., 77, p. 319), comparisons are given of the ferments present in the extracts of the skin of different rabbits homozygous for the recessive gene a_n, including their role in pigmentation.

Light and seasonal reproduction in animals, W. Rowan (*Biol. Rev. Cambridge Phil. Soc., 13 (1938), No. 4, pp. 374–402*).—A summary is presented of light relations to reproduction in more than 50 species of domestic and wild animals, birds, reptiles, fish, and insects.

The effect of X-rays on the embryonic development of hens' eggs [trans. title], M. D. Tarnavs'kiĭ (N. D. Tarnavskiĭ, Tarnavsky) (*Akad. Nauk U. R. S. R., Inst. Zool. i Biol., Zbir. Prac. Genet.* (*Acad. Sci. Ukrain. S. S. R., Inst. Zool. and Biol., Mem. Genet.*), *No. 2 (1938), pp. 91–107, figs. 3; Russ., Eng abs., pp. 103–107*).—X-raying eggs with different doses increased the mortality in proportion to the dose from the earliest stages to 6 days of incubation and retarded growth after hatching when the heaviest doses were employed. Various monsters also appeared in the X-rayed groups.

The effect of pregnancy and lactation on growth in the rat, H. H. Cole and G. H. Hart. (Univ. Calif.). (*Amer. Jour. Physiol., 123 (1938), No. 3, pp. 589–597, figs. 3*).—Studies of the growth of pregnant and nonpregnant ♀ rats showed that immediately after conception the food consumption and growth in body weight and skeletal tissue of the pregnant rats increased as compared with the controls. This situation existed whether or not the pregnant ♀♀ suckled their litters.

The practical use of hormones in domestic animals [trans. title], W. Koch (*Ergeb. Biol., 15 (1938), pp. 1–66, figs. 5*).—An account is given of the influence of hormones on reproduction and lactation in mammals, birds, and fish.

The influence of hormones on sex [trans. title], W. Dantschakoff (*Biol. Zentbl., 58 (1938), No. 5–6, pp. 302–328*).—It was found that injections of male and female hormones into chicken, guinea pig, and reptile embryos influenced the development of the secondary sex characters.

Ovaries secrete male hormone, III, IV (*Endocrinology, 21 (1937), No. 5, pp. 633–636, fig. 1; 22 (1938), No. 6, pp. 663–666*).—Two papers are presented.

III. *Temperature control of male hormone output by grafted ovaries,* R. T. Hill.—In continuation of this series, in part previously noted (E. S. R., 78, p. 320),[3] confirmation of the temperature relation to the production of male hormone by ovarian grafts in the ear was gained by holding the mice in chambers at temperatures of 22° and 33° C. for 156 days. The maintenance of the seminal vesicles and prostates in castrated animals held at the lower temperature furnished evidence of male hormone production.

IV. *Effect of ovarian androgens on accessory size in the mouse,* R. T. Hill and M. T. Strong.—Grafts of ovarian tissue in normal males were found to stimulate growth of the seminal vesicles and anterior prostates from an average weight at 120 days of age of about 150 mg in the normal male or castrated male with ovarian grafts to 288 mg in normal males with ovarian grafts. On account of this action and the fact that pregnant mare serum did not alter the response, it is concluded that the androgens of the ovary act separately and independently of those of the testis. They are suggested as different substances, with closely related or identical physiology.

The androgenic activity of ovarian grafts in castrated male rats, R. Deanesly (*Roy. Soc. [London], Proc., Ser. B, 126 (1938), No. 842, pp. 122–135, pls. 3, fig. 1*).—Studies were made of the androgenic activity of ovarian grafts as measured by histological changes in the prostates, seminal vesicles, and the ovarian grafts themselves in the ears of castrated immature male rats. Of

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[3] Anat. Rec., 67 (1937), No. 4, Sup. 3, pp. 24, 25.

29 grafts which persisted, 24 were androgenic as judged by the increased size of the prostates and seminal vesicles and stimulation of active secretory epithelium. The functional grafts were first oestrogenic, as determined by fibrosis of the seminal vesicles, and finally androgenic. Under such conditions, the follicles in the grafts enlarged as in oestrus, but the ova were apparently absorbed. Luteinization was irregular but originated in the thecal rather than the granulosa cells. Theca-luteinized cells seemed to be the principal producers of the androgenic secretion. Injections of pregnancy urine causing extensive luteinization did not affect the androgenic activity. A lessened response of the vesicular epithelium, as contrasted with the prostate, suggested that testosterone was not the androgenic substance concerned. In contrast to Hill's findings with mice, noted above, androgenic activity did not seem to depend on the environmental temperature at which the rat was maintained.

A method for the isolation of pregnandiol from the urine of pregnant mares, P. G. Weil (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 4, pp. 503, 504*).—Based on a method for the quantitative determination of pregnandiol in human pregnancy urine, a method is described for the isolation of this hormone from the urine of pregnant mares.

High gonadotropic hormone concentration in pregnant ponies, H. H. Cole. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 2, pp. 193, 194*).—The gonadotropic hormone potency of serum from pregnant Welsh ponies ranged, in many cases, from 200 to 400 rat units per cubic centimeter, with only from 12 to 100 rat units per cubic centimeter in serum from thoroughbred or draft mares. The maximum concentration was found at from 60 to 75 days after breeding.

The progestin content of the corpus luteum of the sow (Sus scrofa) during the successive stages of the estrous cycle and pregnancy, G. Kimura and W. S. Cornwell (*Amer. Jour. Physiol., 123 (1938), No. 2, pp. 471–476, fig. 1*).—Determination of the progestin present in the corpora lutea of sows slaughtered at different stages of the oestrous cycle and pregnancy showed that there was a sharp increase in the progestin production per unit of corpus luteum material and per sow between the tenth and fifteenth day of the oestrous cycle, the period during which the embryo becomes attached if pregnancy follows. There was a continued rise to the 15- to 20-day period, with a high production of progestin continuing through about 105 days, after which there was a marked drop. Progestin is available and therefore probably required during all but the last few days of pregnancy.

Proliferation of crop-sac epithelium in incubating and in prolactin-injected pigeons studied with the colchicine method, E. L. Lahr and O. Riddle (*Amer. Jour. Physiol., 123 (1938), No. 3, pp. 614–619, figs. 3*).—Increased proliferation of the crop-sac epithelium was found to follow almost immediately the intramuscular administration of 60 bird units of prolactin, attaining a maximum in 2 hr. A much greater maximum mitotic rate followed a second injection of prolactin. There was a close relationship of prolactin production by the bird and the onset of broody behavior. A high rate of mitosis continued throughout the incubation period. The intramuscular injection of 0.6 mg of colchicine arrested mitosis in the crop-sac epithelium from the sixth to the sixteenth hour after administration.

Failure of atropine to prevent ovulation following coitus in the rabbit, A. W. Makepeace (*Endocrinology, 23 (1938), No. 2, pp. 241, 242*).—Notwithstanding the findings of M. A. Foster, H. F. Haney, and F. L. Hisaw,[4] the intravenous administration of as much as 6 mg of atropine sulfate per kilogram live weight did not prevent ovulation in rabbits, although many oestrous rabbits were thrown out of heat as a result of this treatment.

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[4] Soc. Expt. Biol. and Med. Proc., 32 (1934), No 2, pp. 351–353.

Mechanism of oestrus inhibition in the mouse during pregnancy, J. M. Robson (*Quart. Jour. Expt. Physiol. and Cog. Med. Sci., 28 (1938), No. 2, pp. 195–205, figs. 3*).—A score was worked out to measure quantitatively the vaginal response to varying doses of oestradiol in the spayed mouse. Response was slight in pregnant animals until the doses of oestradiol were approximately 10 µg. The inhibitory effect of 0.2 mg of testosterone propionate, although similar to the effect of 1 mg of progesterone on spayed mice, was less pronounced. The extraovarian production of a substance inhibiting vaginal response seemed evident from tests in which oestradiol was administered to spayed pregnant mice which received daily doses of 1 mg of progesterone (sufficient to maintain pregnancy after spaying). The vaginal reaction was similar to that in spayed animals receiving 1.5 mg of progesterone per day. Evidently some oestrus-inhibiting hormone is produced outside the ovary.

FIELD CROPS

Factorial designs in agricultural experiments, R. H. Walker. (Utah Expt. Sta.). (*Utah Acad. Sci., Arts, and Letters, Proc., 15 (1937–38), pp. 1–3*).—The principles and advantages of the factorial design are explained.

The importance and use of appropriate assumed means in collating field experimental results statistically, J. B. Bourne (*Trop. Agr. [Trinidad], 15 (1938), No. 11, pp. 247–258*).—Methods for combining results of several oats experiments when a different and appropriate "assumed mean" is used for each are described, with detailed examples.

Separating a generalized interaction into components, W. B. Kemp. (Univ. Md.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 5, pp. 419–424*).—When many strains of plants are compared through several seasons in a single variety test, a significant variety-season interaction is likely to appear because some but not all strains show differential response to the seasons. The procedures presented, with data from a wheat variety test, make it possible to separate the gross interaction into components which trace to each comparison between any two strains so that significant and insignificant components may be separated.

[Field crops research at the Georgia College of Agriculture] (*Ga. Univ. Bul. 708 (1938), pp. 3–8, 11–17, 20–27, 30–34, figs. 14*).—Brief reports of the progress of agronomic investigations during 1937–38 are given in articles entitled Permanent Pasture Investigation, by M. P. Jarnagin (pp. 3–5); Winter Grazing Crops (pp. 6–8) and Varieties of Soybeans for North Georgia (pp. 16, 17), both by J. R. Fain; Adapting Vetches to Georgia Conditions, by G. D. Thornton (pp. 11, 12); A Study of Grain Sorghum, by F. B. Lanham and G. D. Thornton (pp. 13–15); An Analysis of the Cotton Variety Test, by C. C. Murray (pp. 20–27); and Sweetpotato Storage, by H. E. Lacy and R. L. Keener (pp. 30–34).

Swedish contributions to the development of plant breeding, Å. Åkerman, I. Granhall, G. Nilsson-Leissner, A. Müntzing, and O. Tedin (*Stockholm: Alb. Bonniers Boktr., 1938, pp. 111, [figs. 57]*).—An account of the history and status of plant breeding in Sweden, especially the work of the Swedish Seed Association at Svalöf, is presented with discussion of facilities, general methods and special technic, and local tests, current work, and outstanding productions in the breeding of wheat, oats, barley, rye, sugar beets, mangels, turnips, potatoes, grasses and clover, and alfalfa.

The correlation among various constituents of forage plants, J. E. Greaves. (Utah Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 9, pp. 754–759*).—When 72 samples representing 16 species of forage plants growing on the Trout Creek winter range in Juab County, Utah, were analyzed, significant correlations were found between ash and calcium, ash and magnesium, ash and sulfur, calcium and magnesium, calcium and sulfur, phosphorus and crude protein, phosphorus and crude fat, and sulfur and crude protein. Highly significant negative correlations were found between ash and phosphorus, ash and crude fat, calcium and phosphorus, calcium and nitrogen-free extract, phosphorus and crude fiber, sulfur and crude fiber, and crude fiber and crude protein.

Economical uses of fertilizer elements by certain forage crops, B. E. Gilbert and F. R. Pember. (R. I. Expt. Sta.). (*Soil Sci., 46 (1938), No. 4, pp. 279–285*).—From their response as shown by dry weight yields of roots, tops, and clips when grown in soil and in solution cultures, Colonial bent and redtop evidently require less potassium and phosphorus for good growth than does timothy. All three grasses require high fertilization with nitrogen.

Cereal growing on weedy land in northeastern Saskatchewan: Effect of heavy seeding with the use of fertilizer on the development of weeds and crops, G. L. Godel (*Sci. Agr., 19 (1938), No. 1, pp. 21–32, figs. 2*).—Farm practices generally recommended for weed control have failed to reduce infestation of Saskatchewan farms by wild mustard, wild oats, and stinkweed, and the use of chemical sprays and delayed seeding to oats or barley for feed also have many objectionable features. Seeding grain at rates heavier than normal (E. S. R., 74, p. 634) with phosphates drilled in with the seed provided a practical method for weed control in annual crops which involves little extra labor, and the higher yields more than offset the cost of extra seed and of fertilizer. Heavy seeding with fertilizer results in increased maturity, shorter spikes, little tillering, and more plants, but has little effect on kernel size or on weight per bushel. It is currently recommended for weedy fields in the park and wooded soil areas.

Fertilizer and manure experiments on Dunmore silt loam soil, M. S. Kipps and T. B. Hutcheson (*Virginia Sta. Bul. 317 (1938), pp. 22, figs. 6*).—Responses of corn, wheat, clover hay, and timothy and redtop hay, grown in rotation, to manure and fertilizers, 1914–37, are summarized by crops and by three 8-yr. periods, supplementing previous reports (E. S. R., 42, p. 21; 57, p. 426). When the four crops were considered as one unit, phosphorus produced marked yield increases, while nitrogen and phosphorus resulted in smaller yields than from phosphorus alone. Potash with phosphorus caused marked yield increases of both corn and clover but very small increases of wheat and grass hay. Nitrogen, phosphorus, and potash together resulted in significant increases in wheat and grass hay yields but not in corn and clover hay yields. Potash became progressively more important during the three 8-yr. periods, and so did nitrogen for both wheat and grass hay, but for corn and clover hay it declined in importance. A fertilizer carrying both phosphorus and potash, e. g., 200 lb. of 0–14–6, evidently should be used on soils of this type for the crops of the rotation. Fertilizer applied at planting for corn and wheat may omit nitrogen, which might be used as a top dressing whenever grass hay or wheat shows slow growth in the spring. If clover fails, nitrogen can be applied as a constituent of fertilizer for corn and wheat.

Comparison of average acre yields of corn, wheat, and clover hay grown in a 4-yr. rotation with those grown continuously, with and without raw rock phosphate and manure, 1914–37, inclusive, showed that wheat and grass hay or permanent meadows but not corn may continue on the same land if proper attention be given fertilizer treatments and meadows reseeded with legumes at intervals without plowing.

As indicated by production in a 3-yr. rotation of corn, wheat, and clover hay, superphosphate produced higher yields of clover hay and wheat but lower corn yields than did other carriers. Basic slag supplemented with gypsum produced the greatest total weight of crops per acre, slightly exceeding superphosphate; but when supplementing manure, superphosphate surpassed the other phosphorus carriers in this respect. Superphosphate was superior to raw rock phosphate either in light annual applications or in heavy applications every 6-yr., but crop yields from the two types of applications did not differ significantly. Basic slag proved most efficient of the carriers per pound of actual phosphoric acid content, slightly surpassing superphosphate, which in turn was more efficient than bonemeal and raw rock phosphate. Raw rock phosphate and superphosphate held the same relative position as phosphorus carriers regardless of the nitrogen carrier supplement. Sodium nitrate was most efficient in combination with these materials, and dried blood and sulfate of ammonia were slightly less effective. Gypsum resulted in no yield increase, indicating that the soil did not lack sulfur.

Yields of corn, wheat, clover hay, and mixed hay in a 4-yr. rotation where equal total amounts of manure and of superphosphate were applied but at different intervals, 1917–28, indicated that lighter frequent applications of manure are a better management practice than applying heavy quantities less often. On the other hand, 600 lb. superphosphate applied once in 4 yr. produced higher yields of crops than 300 lb. twice in 4 yr.

Common native grasses of Nebraska, A. L. FROLIK and F. D. KEIM (*Nebraska Sta. Circ. 59 (1938), pp. 52, figs. 24*).—The 24 native grasses most important and with widest distribution in Nebraska, described and illustrated with remarks on economic value, include saltgrass; lovegrass; western wheatgrass; wild rye; junegrass; bluejoint; northern and sand reedgrass; alkali, tall, sand, and prairie dropseed; Western needlegrass; needlegrass; side-oats, blue, and hairy grama; buffalo grass; sloughgrass; switchgrass; big, sandhill, and little bluestem; and Indian grass.

Common British grasses and legumes, J. O. THOMAS and L. J. DAVIES (*London and New York: Longmans, Green and Co., 1938, pp. VII+124, figs. 50*).—The morphology, botanical characteristics, and economic values of a number of common grasses and legumes are described with determinative keys, a glossary, and an index.

Meadows and pastures, E. KLAPP (*Wiesen und Weiden. Berlin: Paul Parey, 1938, pp. VII+338, figs. 164*).—Concerned with the establishment, management, and uses of grasslands, this book treats of the importance and status of grassland; essential growth factors; drainage and irrigation; reclamation of waste lands; grassland improvement; forage plants and seeds mixtures; planting practices and cultural methods; control of weeds and insect pests; management practices; and the value and preservation of harvested forage. An index, a bibliography of 364 citations, and a list of periodicals concerned with forage production are also included.

Pasture improvement practices in Rhode Island, T. E. ODLAND and R. S. SHAW (*Rhode Island Sta. Bul. 270 (1938), pp. 24, figs. 11*).—Methods used for improving pastures in Rhode Island are described from results of a survey on 70 dairy farms in 1936 and from cooperative pasture improvement studies made on 8 farms by the extension service, 1929–31. Suggestions based on these results are made on fertilizers, liming, seeds mixtures, and pasture management.

Increased use was being made of tillable land for pastures, as has been warranted by the returns from good pastures. Farmers tended more and more to use additional supplementary and temporary crops for pasture to obtain even grazing throughout the season, and most of those interviewed found fertilizing pastures to be a profitable practice. Complete fertilizer was most commonly used, yet manure was spread on pastures on most farms. Liming pastures was also increasingly practiced. Under a good system of fertilization and management Kentucky bluegrass and white clover became the dominant plants in permanent pastures. Application of complete fertilizer and lime on permanent pastures produced greatly increased yields of grass and brought about decided savings in the cost of milk produced. Returns over feed cost during the pasture season were directly proportional to the amount of grazing available.

Inducing germination in Oryzopsis hymenoides for range reseeding, L. A. STODDART and K. J. WILKINSON. (Utah Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 9, pp. 763–768*).—Failure of untreated seed of perennial bunch grass (Indian ricegrass) to germinate appeared due to undeveloped embryos in more than half of the seeds. Undeveloped seeds can be removed by submerging the seed in water for 5 min. Firm seed coats of developed seed could be remedied best with concentrated sulfuric-acid treatment for from 15 to 45 min. with small seed and for from 60 to 120 min. with large seed. An average germination of 50 percent resulted from the treatments, and more than half of the seed germinating became successfully established in soil.

The rate of seeding Grimm and common alfalfa, C. J. WILLARD. (Coop. U. S. D. A.). (*Ohio Sta. Bimo. Bul. 195 (1938), pp. 181–195, figs. 3*).—Results, 1932–36, are reported from four seedings of Grimm and common alfalfa made at rates ranging from 2.5 to 50 lb. of seed per acre at Holgate on Brookston clay in a companion crop of oats. Seeding above 7.5 lb. per acre did not give significant increase in yield of hay per acre. The most desirable rate was neither affected by broadcasting or drilling as such nor by variety. Grimm outyielded common by very similar percentages at all rates. Hay from thick rates was considerably finer than from thin rates and had many more stems per unit area, each of which was smaller in diameter and weighed decidedly less. There were no significant differences in percentages of leaves or of protein in hays from different rates and no significant increase in weight of air-dry roots per acre for rates above 12.5 lb. per acre. Although the average standard rate of seeding alfalfa in Ohio is from 10 to 12 lb. per acre, 7 lb. is deemed enough under the best conditions. If 15 lb. per acre will not give a satisfactory stand, some condition other than seeding rate needs correction.

Partial self-incompatibility in Medicago sativa, R. A. BRINK and D. C. COOPER. (Univ. Wis.). (*Natl. Acad. Sci. Proc., 24 (1938), No. 11, pp. 497–499*).—The fact that cross-pollination of alfalfa increases the production of seed, as compared with close-pollination, was shown to be associated with two phenomena, possibly unrelated, whose effects could be distinguished by histological study of the pistil following the two types of matings. The plant is found to be partially self-incompatible (self-sterile), and there is the markedly greater tendency for ovules containing inbred embryos rather than those resulting from cross-pollination to collapse during development.

The identification by field inspection of commercial barleys of the Middle-West, W. A. CLARK (*Brewers Digest, 13 (1938), No. 12, pp. 23–28, figs. 10*).—Seven agronomic characters and reactions to six diseases are tabulated, with appropriate illustrations for the Oderbrucker, Wisconsin Pedigree 38, Manchuria (Minnesota–148), Velvet, Odessa, Glabron, Peatland, Trebi, and Spartan barleys.

A preliminary survey of malting quality of barley varieties grown in the United States, J. G. Dickson. (U. S. D. A., Wis. Expt. Sta., et al.). (*Brewery Age, 6 (1938), No. 10, pp. 61–66*).—Comparison of the malting quality of five important commercial barley varieties, based on studies 1934–37, showed that in malting quality at least Velvet smooth-awned barley resembles Oderbrucker and Manchuria. Wisconsin Barbless, grown extensively in the north-central area, is rather inferior in malting quality to these barleys, but appears to be on the malting barley market indefinitely unless the industry can afford to pay a relatively high but apparently unwarranted premium to increase the acreage of Oderbrucker in the area. Results obtained in periodic cutting experiments suggest that cutting barley before it is fully mature reduces extract yield. Aims of the cooperative barley breeding and malting research program are outlined.

A survey of malting quality of barley varieties grown in the United States, J. G. Dickson. (U. S. D. A., Wis. Expt. Sta., et al.). (*Mod. Brewer, 20 (1938), No. 4, pp. 36, 38, 40, 42, 44, 86, 87*).—This is noted in full above.

Barley production in Kansas, A. F. Swanson and H. H. Laude. (Coop. U. S. D. A.). (*Kansas Sta. Bul. 280 (1938), pp. 27, figs. 8*).—Cultural methods, field and harvesting practices, and varieties are recommended from experiments of the station, the U. S. Department of Agriculture, and others; and information is given on the status, adaptation, utilization, and feeding of the crop and the control of disease and insect pests of barley. Approved practices include a firm seedbed with plenty of moisture in the upper subsoil; rotations such as sorghum, barley, and wheat, or sorghum, barley, fallow, and wheat; from 5 to 7 pk. per acre sown from March 15 to April 10, both depending on locality; and use of the productive, barbless Flynn or the older Stavropol and "Malt" barleys, all spring varieties. Of the several harvest methods used in Kansas, combining is cheapest, harvesting with the swather pick-up gives better quality but costs more, binding followed by careful shocking and early threshing produces the highest quality of grain, while harvesting with the header may result in considerable spoilage.

The establishment of low hop clover, Trifolium procumbens, as affected by time of seeding and growth of associated grass, E. A. Hollowell. (U. S. D. A. and Ky., Mo., N. C., Tenn., Miss., and Ga. Coastal Plain Expt. Stas.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 7, pp. 589–598*).—At northern stations, hop clover sown in September and October on Kentucky bluegrass clipped closely usually produced excellent stands, whereas seedlings made on tall grass and cultivated soil resulted in partial stands or failures. Insufficient light for establishment of seedlings appeared to be a major reason for failure when hop clover is grown with Kentucky bluegrass. In the southern locations, October, November, and early December seedings were found superior. Stands obtained in tall grass were as good as in clipped grass when hop clover was sown on Bermuda grass turf, which gives only a thin ground cover. Plantings on carpet grass turf with a dense ground cover were affected adversely by the tall grass competition. The beneficial effects of the companion grass in conserving soil moisture for establishment of the clover seedlings were apparent at several stations.

Preliminary tests of corn hybrids in North Carolina, 1938, G. K. Middleton and P. H. Harvey (*North Carolina Sta. Agron. Inform. Circ. 114 (1938), pp. [2]+4*).—In comparative tests of the best corn hybrids obtainable from nine other experiment stations, the U. S. Department of Agriculture, and seed companies, several hybrids outyielded the best local variety and others equaled the varieties at Swannanoa in the western North Carolina highlands, while at Rocky Mount and Clayton, farther east, with a few promising exceptions, hybrids from a distance showed lack of adaptation and were soft, starchy, and light in weight.

Shelling percentage and test weight per bushel in Ohio corn hybrids, G. H. Stringfield. (Coop. U. S. D. A.). (*Ohio Sta. Bimo. Bul. 195 (1938), pp. 205–209*).—Shelling comparisons between 14 hybrids and the Cook, Woodburn, and Clarage corn varieties grown in official field performance plats, 1936 and 1937, showed that hybrids differ in this character and might be expected to shell from 1 to 4 percent below (based on total ear weights) high-shelling corn as Woodburn, or closely approach early Clarage. Average values were 59.8 lb. from 70 lb. of ears for the varieties and 58.6 for the hybrids. Data on test weights per bushel did not show general superiority of either group.

The effect of various treatments on the rate of decomposition of organic matter in soils under continuous corn, W. J. Peevy, F. B. Smith, and P. E. Brown. (Iowa Expt. Sta.). (*Iowa Acad. Sci. Proc., 44 (1937), pp. 91–95*).—Under continuous corn, 1917–36, the organic matter content of the soil could not be maintained even with relatively large applications of manure.

The effect of drought and heat in 1936 on the functioning of the staminate flowers of maize, J. N. Martin. (Iowa State Col.). (*Iowa Acad. Sci. Proc., 44 (1937), pp. 55–59, figs. 8*).—Drought and heat in 1936 interfered greatly with the normal functioning of staminate flowers of corn by killing staminate spikelets and by inhibiting the swelling of lodicules, elongation of filaments, and formation and opening of dehiscing pores in many spikelets not so severely affected. The ability of corn pollen to survive extremes of drought and heat is attributed to its early formation, while the tassel is still enveloped by leaves.

The cultivation and preparation of flax (*Jour. Council Sci. and Indus. Res. [Austral.], 11 (1938), No. 3, pp. 239–246*).—A review of recent practices including a selected bibliography of 29 titles.

Breeding better flax varieties for Minnesota, A. C. Arny. (Minn. Expt. Sta. and U. S. D. A.). (*Minn. Acad. Sci. Proc., 4 (1936), pp. 29–38*).—Correlated inheritance in flax crosses was studied with reference to characters of economic importance. Bison, currently the most widely grown flax in Minnesota, produces large seeds high in oil of low quality as measured by iodine number. Linkage between low weight per 1,000 seeds and high iodine number, found in segregates from Bison × Redwing and Bison × Common Pink, made it difficult to recover from these crosses plants combining the medium large seed size of Bison and the high oil quality of the other parents. However, lines selected from these two crosses have equaled the high iodine parents in quality of oil, and some of them approached Bison in seed size. Segregation from Redwing × 770B (E. S. R., 76, p. 174) in the ratio of three low to one high in iodine number of oil was shown, and individuals with yellow seeds averaged higher in iodine number than those with brown seeds. Linkage between seed color and iodine number was determined.

What the control field showed about 1938 seed oat stocks, M. T. Munn (*Farm Res. [New York State Sta.], 5 (1939), No. 1, pp. 5, 9*).—Examination of 46 samples of oats representing many large stocks on markets in New York showed that 17 lots were unfit for planting because of their noxious weed seed content. A number were not true to variety and other samples were "just oats." In rod-row comparisons the marked superiority of the certified Lenroc check and high-yielding sorts was clearly evident. See also a previous note (E. S. R., 80, p. 191).

Growing good crops of oats in Missouri, W. C. Etheridge and C. A. Helm (*Missouri Sta. Bul. 402 (1938), pp. 11, figs. 4*).—A revision of Bulletin 359 (E. S. R., 75, p. 42).

Commercial fertilizers in Colorado in 1937, C. H. METZGER. (Colo. State Col.). (*Amer. Potato Jour., 15 (1938), No. 9, pp. 252–261*).—According to results during 1936 and 1937 (E. S. R., 78, p. 622), commercial fertilizers have not been very promising for increasing potato yields in Colorado. Yield differences were variable, although phosphate was most consistent in increasing production. Phosphate, complete fertilizer, and potash increased, whereas ammoniated phosphate and nitrogen depressed, the yield of U. S. No. 1 tubers. Phosphate seemed to increase starch slightly, but ammoniated phosphate, potash, complete fertilizer, and nitrogen decreased it in order. Formulas containing phosphorus increased dry-matter content in the order phosphate, ammoniated phosphate, and complete fertilizer, while potash and nitrogen resulted in decreases. Phosphate most favorably affected general appearance, maturity, handling qualities, and russeting or netting in the Russet Burbank potato. Potash had favorable effects on tuber shape and in a light application with a heavy rate of phosphate produced the best tubers.

Magnesium studies with the potato, J. A. CHUCKA and B. E. BROWN. (Maine Expt. Sta. and U. S. D. A.). (*Amer. Potato Jour., 15 (1938), No. 11, pp. 301–312*).—The main observations in fertilizer tests in Aroostook County, Maine, 1930–37, involving several magnesium carriers have been noted (E. S. R., 73, p. 448).

Potato conference at Presque Isle, Maine, and Fredericton, New Brunswick, F. J. STEVENSON. (U. S. D. A.). (*Amer. Potato Jour., 15 (1938), No. 10, pp. 277–284*).—A résumé of reports (August 22–25, 1938) by researchers in the State experiment stations and the U. S. Department of Agriculture on objectives and progress in breeding potatoes for different regions, yield, earliness, resistance to scab, late blight, leaf-roll, mosaics, and other virus diseases, and culinary quality, and the development of breeding methods and field technic.

Self-pollination in rape, V. G. SUN (*Jour. Amer. Soc. Agron., 30 (1938), No. 9, pp. 760–762*).—Bud pollination proved to be the most effective method for obtaining selfed seed in rape. There was evidence that the middle of the flowering period may be the best stage for artificial selfing. Covering the inflorescence with a paper bag gave enough seed and appeared to be practical for selection in self-pollinated lines.

Extent of natural crossing in rice, H. M. BEACHELL, C. R. ADAIR, N. E. JODON, L. L. DAVIS, and J. W. JONES. (U. S. D. A. and Ark., La., Tex., and Calif. Expt. Stas.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 9, pp. 743–753*).—Natural crossing in four pairs of glutinous and common rice varieties grown, 1931–36, at stations in the principal rice-growing States ranged from 0 to 3.39 percent and averaged 0.45 percent. Its extent varied from year to year in a given variety in the same locality, differed among varieties, and was influenced markedly by seasonal and environmental conditions and in some rices with spacing. Much more occurred in the Southern States than under the higher temperature and lower humidity conditions prevailing in California.

The growth curve of sorghum, A. T. BARTEL and J. H. MARTIN. (U. S. D. A. and Ariz. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 11, pp. 843–849, figs. 3*).—Dwarf hegari and Double Dwarf Yellow milo, field-grown at Tucson, Ariz., 1931–34, produced about 10–15 percent of the final dry weight of stalks and heads during the first half of the growing period. Growth curves in both June 18 and July 22 plantings indicated a much slower increase in growth in early developmental stages and a faster increase at later stages than expected from the usual symmetrical sigmoid growth curve typical of many plants. A close relationship was found between the size of seed planted and the dry weight per stalk in the early stages of plant development where two varieties of corn, four of sorghum, and one of proso, representing a wide range of seed sizes, were field grown in 1936. In young seedlings 10 and 12 days after planting the logarithm of weight per stalk was directly proportional to the logarithm of weight per seed.

The response of soybeans to sources of nitrogen in the field, W. B. ANDREWS. (Miss. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 9, pp. 779–786*).—Biloxi soybeans, inoculated and uninoculated, were grown in 1937 on limed and unlimed Lufkin clay (pH 4.6–4.9) receiving four nitrogen carriers. Yields and nitrogen content data indicated that carbohydrate production was at a high level. Sodium nitrate and urea were superior to ammonium sulfate and cyanamide in production on unlimed soil and increased the nitrogen content of the soybeans. On limed soil ammonium sulfate almost equaled urea and sodium nitrate, while cyanamide was decidedly inferior. Lime increased yields with ammonium sulfate and decreased it where urea, cyanamide, and sodium nitrate were applied. Inoculation produced significant yield increases with sodium nitrate and cyanamide but not where ammonium sulfate and urea were used, and did not increase the nitrogen content of soybeans with any nitrogen carrier. The native strain of soybean root nodule bacteria needed lime on the unlimed soil more and was less adapted to the soil conditions than the strain applied. Carbohydrate production was much higher in 1937, with good distribution of rainfall, than in 1933, a dry year, but the nitrogen content was much higher in 1933 when the plants obtained nitrogen primarily from the soil and root nodules. The response of soybeans to ions associated with nitrogen is also discussed.

Review of papers on sugar technology during the last two years, J. P. CARABIA (*Asoc. Téc. Azucareros Cuba, Proc. Ann. Conf., 11 (1937), pp. 295–312*).—Features of the 196 papers reviewed are grouped as genetics and cane varieties, inflorescence and ripening, root studies, nutrients, growth, agronomy, phytopathology, entomology, fabrication, machinery, and byproducts.

German-English technological and commercial dictionary of the sugar industry, with English-German supplement, W. KERSTEN (*San Francisco: West. Sugar Refinery, 1936, pp. 28*).—This dictionary is designed for sugar specialists.

Technical lexicon for the sugar industry, E. KNÖCHEL (*Fachwörterbuch für die Zuckerindustrie. Berlin: E. S. Mittler & Son, 1938, pp. 224*).—Equivalents for terms used in the technical literature of the sugar industry are listed in English-German and German-English sections.

Sweetpotatoes in Kansas, O. H. ELMER (*Kansas Sta. Bul. 278 (1938), pp. 52, figs. 12*).—Practical information is given on varieties and planting stock of sweetpotatoes; growing plants in hotbeds; planting, cultural, and harvesting practices; curing and storage; sterilization of storage houses; and marketing. Control methods are outlined for the stem, black, soft, surface, foot, charcoal, Java black, and dry rots; soil pox; scurf; *Rhizoctonia;* mosaic; leaf diseases; insects; and rodents.

Tobacco breeding bibliography (*Cambridge, Eng.: Imp. Bur. Plant Genet., 1937, pp. [2]+36*).—The 257 citations are arranged alphabetically by authors with references and reviews in *Plant Breeding Abstracts*.

Cropping practices for flue-cured tobacco in the Norfolk district of Ontario, F. A. STINSON (*Sci. Agr., 19 (1938), No. 1, pp. 42–47*).—A rotation in which tobacco is grown every second year with rye on the land during the intervening period has given best results in studies on Fox coarse sand at the Delhi (Ont.) Experimental Station. Following a 2-year-old alfalfa sod, tobacco grew very large, matured slowly, and was low in quality, and tobacco planted after soybeans or corn suffered from brown root rot and reduced growth resulted. Lower yields and returns evidently may be expected when tobacco is grown 2 yr. or longer in succession on the same land.

A study of mineral nutrition of wheat as influenced by fertilizer combinations, F. T. Donaldson. (Mont. Expt. Sta.). (*Plant Physiol., 13 (1938), No. 4, pp. 737-766, figs. 10*).—The nutrition of Marquis wheat as influenced by five fertilizer treatments was followed through the growing season, the amounts of dry matter, P, S, and N with few exceptions increasing progressively from the first to the last sampling. In all plats a maximum was reached by K 1 mo before harvest, followed by a loss from that time to harvest, while Ca increased rapidly until 1 mo. before harvest and then remained fairly constant. Curves for the rates of nutrient assimilation showed the effects of drought and subsequent irrigation on the movement of plant nutrients. As desiccation progressed there was a decreased movement of P, Ca, N, and S into the plant, and following the application of water the upward movement again increased. At this time K was moving out of the plant, and desiccation decreased the downward movement, but following irrigation the latter increased. The results are believed to indicate that the length of the growing season may alter the conclusions drawn from a progressive developmental study. On all plats the heads formed almost exactly half the dry weight of the aerial parts of the plant, and the type of fertilizer treatment had but little effect on this ratio. About equal amounts of Ca, P, and S occurred in the mature plant, but their distribution between the heads and the straw varied widely. Practically all the Ca and most of the K entering the heads was found there a week before harvest, but P, S, and N were still entering when the grain was harvested.

The effect of carbon dioxide on the yield, phosphorus, and calcium contents of wheat, F. B. Smith, P. E. Brown, and H. C. Millar. (Iowa Expt. Sta.). (*Iowa Acad. Sci. Proc., 44 (1937), pp. 79-84*).—Wheat yields on Carrington loam, receiving carbon dioxide as gas or dissolved in water, were not influenced significantly, but the phosphorus contents of grain and straw and the calcium content of the grain were increased.

Correlations between annual precipitation and the yield of spring wheat in the Great Plains, J. S. Cole. (Coop. Mont., N. Dak., Wyo., Nebr., Colo., and Kans. Expt. Stas.). (*U. S. Dept. Agr., Tech. Bul. 636 (1938), pp. 40, figs. 10*).—Studies of the relations between annual precipitation and yields of spring wheat were made with data covering a total of 387 crop years at 19 field stations in the Great Plains on precipitation for the year ended July 31 and 3 indexes of yield of spring wheat. The primary study was made with an index of average yields of about 30 plats representing low-, medium-, and high-yielding methods, and studies on average yields of continuously cropped plats, a low-yielding method, and average yields on fallowed land, a high-yielding method, were in less detail.

Correlation of precipitation and average yield at the several stations ranged from 0.61 to 0.9 and averaged 0.76. Conditions resulting in yields markedly above or below quantities indicated by the annual precipitation are described.

Similarity in regression of wheat yield on precipitation placed all stations north of and including Archer, Wyo., in a group designated "northern," i. e., distinct from all stations to south of and including North Platte, Nebr. The average (weighted) precipitation for 272 station-years, 1906-35, at northern stations was 14.96 in., the average (weighted) yield 15.18 bu., the correlation coefficient 0.74, and the regression equation was: Yield=(precipitation—8.02) 2.19.

Precipitation above or below the mean was accompanied by a yield in the same bracket in the ratio of 3.77 times to 1 when it was not. When the 272 pairs of variables were reduced to 30 pairs representing annual averages for each year, 1906–35, the coefficient of correlation rose to 0.88. The regression equation was: Yield=(precipitation—10.07) 3.19.

Methods such as continuous cropping to small grains that left the soil exhausted of available water when the crop year began increased the dependence of the crop on precipitation during the crop year, which was evidenced by higher coefficients of correlation; whereas the crop depended less on precipitation during the crop year when methods such as summer fallow that stored water in the soil before the crop year began were used.

Effect of weather variants on field hardening of winter wheat, C. A. Suneson and G. L. Peltier. (U. S. D. A. and Nebr. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 9, pp. 769–778, fig. 1*).—Data on the seasonal progression and annual variations in the cold resistance of field-grown winter wheats, 1931–36, at Lincoln, Nebr., and associated variations in environment, were used in a study of the more obvious weather factors contributing to field hardening. Two apparently distinct hardening stages were recognized During November and early December, high daily temperature maxima in conjunction with high radiation appeared most conducive to hardening, high temperatures with low radiation or high radiation with low temperatures least effective, and high temperatures and radiation effective only in increasing hardening under the influence of shortening days. Rather xeric conditions also appeared to favor hardening. Indications were that maximum hardening at this period results from a radiation-temperature balance reacting with day-length and drought influences to give maximum accumulation of organic reserves. Subsequent exposure to sustained low temperatures resulted in further progressive increases in hardiness for about 3 weeks, a reaction which seemed always to effect maximum hardening for the season. Experiments showing a reduction in hardiness under the influence of reduced light intensity are also reported.

Quality of 1938 North Dakota wheat, R. H. Harris and T. Sanderson (*North Dakota Sta. Circ. 63 (1938), pp. 18, figs. 2*).—A series of 83 samples of hard red spring wheat grown in different localities in North Dakota in 1938 was cleaned and milled, and the flours produced were analyzed and baked as in 1937 (E. S. R., 78, p. 624). The test weight, flour yield, and loaf color were higher in 1938, while wheat and flour protein and loaf volume were higher in 1937. Larger variability or differences in the same quality factors were noted in test weight, flour yield, protein, and loaf volume A in 1937 than in 1938, probably due to the extensive rust epidemic of 1937, which affected life processes of the plant in large areas of the State with consequent effect upon kernel constituents. Correlation coefficients showed the importance of test weight to flour yield, of wheat protein to flour protein, and of flour protein to loaf volume. Thatcher showed higher flour yield and loaf volume than Reward, Ceres, Marquis, and other varieties tested.

The bindweed program of Kansas (*Kans. State Bd. Agr. Rpt., 57 (1938), No. 227, pp. 43, figs. 7*).—The text of the Kansas noxious weeds law, approved February 25, 1937, is presented with official methods and rules and regulations for control of bindweed (*Convolvulus arvensis*) by cultivation, smother crops and chemicals (based extensively on research by the Kansas Experiment Station), and a review of practical experience of farmers in bindweed control.

Perennial pepper-cress, Lepidium latifolium L., M. K. Bellue (*Calif. Dept. Agr. Bul., 27 (1938), No. 3, pp. 296–300, figs. 3*).—Perennial pepper cress, a deep-rooted perennial newly recorded for California, is persistent where established but has not spread extensively where clean cultivation can be practiced. It resembles hoary cress, particularly in the early stages of growth, but may be distinguished by its smooth, leathery-textured leaves and the form of stem leaves, which taper to a narrow base.

Notes on seed production in the smooth perennial sow thistle (Sonchus arvensis var. glabrescens Wimm. and Graeb.), A. Hayden. (Iowa State Col.). (*Iowa Acad. Sci. Proc., 44 (1937), p. 105*).—Self- or close-pollinated flowers from the same head or from the heads in the same colony produced no fruits, whereas flowers cross-pollinated with flowers from a distant colony made almost as many seeds as there were flowers in the heads (an average of about 200 flowers each).

HORTICULTURE

The use of analysis of co-variance and its limitation in the adjustment of yields based upon stand irregularities, C. H. Mahoney and W. D. Baten. (Mich. State Col.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), p. 558*).—The application of certain statistical treatments to sweet corn and tomato yield data is discussed.

Two new materials in plant nutrition, V. E. Iverson. (Mont. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 763–767*).—Observations are presented on the effects of N, P, dextrose, and potassium permanganate, singly and in various combinations, on the growth and subsequent production of tomato and onion plants. In tomatoes, very little transplant effect was noted. Onion responses were closely associated with temperature. Onion root development was encouraged by low temperature. N was beneficial at high and detrimental at low temperatures. The physiological condition of the transplants seemed more important than size in determining the later yields. N increased and potassium permanganate reduced the percentages of cracked tomato fruits. N greatly increased the amount of blossom end rot disease in the tomato.

Synthetic growth substances as aids in plant propagation, K. D. Brase (*Farm Res. [New York State Sta.], 5 (1939), No. 1, p. 6*).—The author emphasizes that different species and even varieties within a single species respond in different ways to treatments with synthetic growth substances. The most important factors are the nature of the plant itself, maturity of the tissues, number of leaves per cutting, light conditions, and the rooting medium.

[Horticulture at the Georgia College of Agriculture] (*Ga. Univ. Bul. 708 (1938), pp. 47–52, 54, 55, figs. 3*).—Two papers are included: The Use of Electrical Bottom Heat in Propagation by Seed and by Cuttings, by T. J. Harrold and R. A. Bowden (pp. 47–52); and Dahlias, by T. H. McHatton and R. A. Bowden (pp. 54, 55).

The effect of a temperature gradient on the distribution of water in apples, tomatoes, oranges, and potatoes, O. F. Curtis and A. K. Clark. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), p. 160*).—Determinations of the effects of temperature differences on water distribution between the heated and unheated sides of fruits and vegetables showed differential species response. In the case of tomatoes and apples, when temperature differences of from 5° to 17° C. were maintained there was a decided movement of water from the warmer to the cooler side. No significant redistribution of water was observed in the case of oranges and potatoes, apparently due to their lack of continuous air passages through which water vapor might diffuse.

The X-ray inspection of internal defects of fruits and vegetables, R. B. Harvey. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 156,* *157*).—Use of the X-ray for discovering hollow heart of potatoes, internal breakdown in apples, and various internal disorders in citrus fruits is described.

Identification of freezing injury in fruits and vegetables, R. B. Harvey. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, *34* (*1937*), *pp. 158, 159*).—Pointing out that freezing injury is often not detected in fruits and vegetables until after several days of storage following transportation, the author states that with the aid of a microscope the torn tissues may easily be seen. The lesions appear as clefts which cannot be produced other than by freezing injury, and thus offer positive identification.

Observations on dormancy in vegetable seed, M. L. Odland. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, *34* (*1937*), *pp. 562–565, figs. 3*).—Repeated germination tests with seed of the cucumber, pumpkin, muskmelon, and watermelon showed these cucurbits to undergo a period of low germination for several weeks following harvest. Peppers and tomatoes, on the other hand, showed no indication of an after-ripening period, germinating equally well at any time following harvest. Carrots also germinated readily.

Use of cellulose film for the production of vegetable plants, A. M. Porter. (Conn. State Col.). (*Amer. Soc. Hort. Sci. Proc.*, *34* (*1937*), *pp. 569, 570*).—Preliminary studies indicated that a cellulose film attached to a glass sash is effective in reducing the loss of heat through the glass. Where the cellulose was placed on the under side of the sash, light transmission was practically the same as with glass alone. There was some loss of light where the film was above the glass, due, apparently, to dust accumulation. Relative humidity was higher beneath the cellulose-covered sashes.

Vegetable growth as affected by location of the heating cable in the hot bed, E. F. Burk and H. N. Colby. (Wash. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, *34* (*1937*), *pp. 721–724*).—Working with hotbeds in which the heating cables were (1) suspended 2 in. above the plants, (2) pressed into the surface soil, (3) embedded 11 in. below the surface, and (4) embedded 4 in. the authors observed that both the earliest germination and the most rapid growth of both cool- and warm-season vegetables occurred in treatment (2). Here the soil temperature was the highest. Plants in treatment (1) were generally tall and rather spindly. Warm-season crops, such as the tomato, grew slowly in treatments (3) and (4).

Early yields of selected truck crops as affected by fertilizer treatments, D. Comin. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, *34* (*1937*), *pp. 673–677, fig. 1*).—Discussing the effects on early yields of manure and fertilizer applications on selected plats in a 4-yr. rotation of tomatoes, cabbage, cucumbers, and sweet corn, the author reports that tomatoes and sweet corn responded most definitely to phosphorus, and the cucumbers and cabbage to nitrogen. The increases in early yields were in the order of from 10 to 20 percent and were highly important in view of declining prices as the season advanced. Increases from phosphorus were particularly significant due to the relatively low cost of this element. Stable manure depressed the early yields of cabbage but was more helpful to early cucumbers than any commercial fertilizer.

Notes on nutrient deficiencies of some vegetable crops, V. A. Tiedjens and L. G. Schermerhorn. (N. J. Expt. Stas.). *Amer. Soc. Hort. Sci. Proc.*, *34* (*1937*), *pp. 704–708*).—On the basis of response in sand and soil cultures in which the nutrient supply was modified, the authors discuss the visual symptoms produced on the foliage of various vegetable species by chemical deficiencies. The effects of deficient N, Mg, P, K, Ca, B, and Fe are considered in detail. Species varied in their responses, but the general symptoms were usually much alike. With insufficient N leaf size was reduced in many cases and the older leaves were the first to show effects. Ca deficiency resulted in greater injury than did any of the other elements. Roots quickly turned brown and died, and attempts to form new roots were only partially successful. The occurrence of deficiencies in the field is discussed.

Asparagus breeding studies, T. M. Currence and A. L. Richardson. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 554–557*).—Studies of a population of 250 Mary Washington plants grown from commercial seed and set in the field in 1932 showed an absence of correlation between size of the 1-year-old plant and yield or spear size. Male plants did not appear to be inherently more vigorous than females, suggesting that differences in yields of the two sexes result, probably, from the burden of seed production rather than inherent genetic causes. Significant negative correlations were observed between both the number of stalks and diameter of the crown of 4-year-old plants and spear size. Positive correlations were noted between numbers of stalks and diameter of the crown and yields. Evidence was secured that the early cuttings are correlated with total productive capacity. The production of progenies obtained by crossing 7 different males on a single female plant showed definite tendencies for the male parent to influence yield and spear size. Observations on the dry weight of the open-pollinated seedlings of 35 females showed significant differences between strains, but there was no correlation of seedling growth with the yielding capacity of the mother plants. As to plant size, there was found no material advantage in using plats of more than 10 plants in length.

Fall cuttings of asparagus compared with spring cuttings under Mississippi conditions, L. R. Farish. (Miss. State Col.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 693–695, fig. 1*).—Plats established in a 1932 planting yielded much larger spring than fall crops except in 1937, when rainfall was above normal throughout the summer. The average weight of spears was consistently lower in the autumn crop, and there was a larger proportion of small spears. The eating quality of the fall-cut asparagus was comparable to that of the spring crop.

Influence of the major fertilizer element on the earliness and yield of snap beans, L. M. Ware. (Ala. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 699–703*).—Of the three major elements, potash was the least effective in relation to yield, both early and total. In one instance, increases in the percentage of potash in the fertilizer actually reduced the percentage of early maturing beans. However, on soils where potash did not appreciably influence total yields, there was no effect on earliness. On new land the response to phosphorus was greater than to any other element. Phosphorus not only increased the total yield of beans but also the percentage of the crop to mature early. Nitrogen greatly increased the yields but reduced the percentage of early maturing beans. However, this reduction was more than offset by the enlarged production. Beans failed to respond to lime and on Cecil soil were apparently reduced in productivity by this element.

The position of poisoned cabbage leaves at harvest, C. L. Fitch. (Iowa State Col.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 571, 572, figs. 5*).—Working with Copenhagen and Hollander cabbage varieties, the author noted that not less than three and up to eight or nine covers of three leaves are laid off after the heads commence to form. This indicates that leaves sprayed or dusted up to and including the loose-leaf stage are not included in the harvested head.

Storage changes in Pascal celery, R. E. Young. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 697, 698*).—At the end of 4 mo. of storage at from 34° to 36° F., during which plants were stored with their roots in soil, it was found that the outer leaf stalks had lost weight while those comprising the heart growth had gained. The total dry weight of the whole plant averaged 44.08 g and 37.54 g before and after storage, respectively. The advisability of leaving as many leaf stalks as possible on stored Pascal celery is suggested.

A study of drouth resistance in inbred strains of sweet corn Zea mays var. rugosa, E. S. Haber (*Iowa Sta. Res. Bul. 243* (*1398*), *pp. 53–72*).—Seeking to establish physical or anatomical characters that could be associated with the known differences in drought resistance in corn inbreds, the author studied lines of sweet corn and of field corn developed by the station. Although the transpiration rate of inbred lines of sweet corn was higher, as a group, in the case of the drought-susceptible lines, the difference was not of sufficient magnitude to be used as a basis of distinction. No significant differences were observed in the numbers of stomata in the lower or upper leaf surfaces of the two groups. No significant differences were found in the weight of the roots of the two classes, nor did the number of nodes below the surface of the soil differ when the two classes were averaged. In sweet corn, the resistant and susceptible lines did not differ significantly in the average number of vascular bundles per unit area of stalk. In field corn, there was a significantly higher number of bundles in the susceptible lines. The exposure, under laboratory conditions, of 20-day-old seedlings to high temperature and low relative humidity proved a satisfactory means of distinguishing drought-resistant or susceptible lines. A temperature of 55° C. (131° F.) for 5 hr. killed most of the susceptible sweet corn plants, whereas some of the resistant plants withstood 55° for 6 hr. Resistant field corn inbreds endured a higher temperature for a longer period than did resistant sweet corns.

Freezing studies with sweet corn varieties in eastern Washington, E. F. Burk. (Wash. State Col.) (*Amer. Soc. Hort. Sci. Proc. 34* (*1937*), *pp. 725–727*).—The results are presented, largely in tabular form, of trials on numerous sweet corn hybrids and varieties for freezing preservation. Tendergold, with a distinctly tender pericarp, is considered the best of the large-eared varieties. Northern Cross ranked highest and Gold Cross 2, second among varieties of medium ear size.

The effect of maturity on sweet corn yield tests, E. S. Haber. (Iowa Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34* (*1937*), *pp. 566–568*).—A total of six sweet corn hybrids and one open-pollinated strain were harvested at the canning and the dry-seed stages to determine the better time for measuring comparative yields. The results were consistent except in one hybrid, which produced significantly less dry seed than the variety but with no material difference at the canning stage. The author concludes that for canning and market-garden varieties, observations at the canning stage are preferable but that the dry-seed measurement may be useful under certain other conditions.

Inbreeding and earworm resistance in sweet corn, C. F. Poole. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34* (*1937*), *p. 575*).—This is an abstract of studies at the U. S. Regional Vegetable Breeding Laboratory at Charleston, S. C.

The importance of root temperatures in growing the fall crop of greenhouse cucumbers, R. A. Schroeder. (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34* (*1937*), *pp. 659, 660*).—That the temperature of the soil has a profound influence on the growth of the cucumber plant was shown in studies in which the soil was maintained at constant temperatures by suspensions of crocks in water baths. At 60° F. top growth was drastically limited, despite favorable air temperatures. At 70° and 85° growth and fruiting were favorable. The moving of plants from 70° or 85° to 60° soil temperature was followed by wilting and leaf and fruit injury. Apparently at soil temperatures of 60° or below and warm air temperatures, the plants were unable to secure adequate moisture to offset transpiration, with resulting injury. Such unfavorable conditions may actually exist in the greenhouse in late autumn.

Hop industry makes gradual growth, J. D. Harlan (*Farm Res. [New York State Sta.], 5 (1939), No. 1, pp. 5, 12*).—Information is presented on the extent and distribution of hop production in New York State.

Dormancy in lettuce seed and some factors influencing its germination, R. C. Thompson (*U. S. Dept. Agr., Tech. Bul. 655 (1938), pp. 20*).—Stating that natural dormancy in lettuce seed may vary in degree from a very slight, easily broken dormancy to an extreme dormant condition very difficult to affect by treatment, the author presents the results of germination trials with lettuce seed of known history subjected to different treatments. Light was found to have a very marked stimulating influence on dormant lettuce seed when moist seed was exposed to temperatures below 20° C. (68° F.). Above 20° the beneficial influence of light decreased rapidly as the temperature rose. Good aeration during treatment to break dormancy was essential if the seed was to be dried again before planting or making germination tests. Dormancy induced or intensified by exposure of moistened seed to high temperature was difficult to break unless the seed was dried and subjected to light treatment at low temperature. Fluctuating temperatures starting low and shifting higher were more effective in the germination of dormant lettuce seed than was constant temperature, either high or low. Poor soil aeration resulting from surface irrigation or other causes resulted in poor germination of lettuce seed, whether naturally dormant or not. The factors influencing germination of lettuce and of dormant lettuce seed form a complex interrelationship, and no single element of the environment, whether light, temperature, aeration, moisture, or something else, appeared to be the one limiting element. No one particular combination of factors provided the optimum environment for all lots of dormant lettuce seed.

The effect of fertilizer treatments on onion bulb characters, A. M. Binkley and O. A. Lorenz. (Colo. State Col.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 717–719*).—In studies of the effect of different fertilizer treatments on the growth of a selected strain of the Sweet Spanish onion, there were noted darker color and more dry scales per bulb in the phosphate-treated plats. These changes are attributed to earlier maturity. There was no significant difference in fresh scale thickness in the onions from the various plats, but in general the average scale thickness was lowest in the nitrogen plats and highest in the complete-fertilizer plats. The average number of hearts per bulb was practically the same with all treatments, with a tendency for the potassium and phosphate plats to show the least and the most hearts, respectively.

Pea varieties for commercial canning and freezing, W. D. Enzie (*Farm Res. [New York State Sta.], 5 (1939), No. 1, pp. 3, 4*).—The results of tests of 15 canning and 16 market-garden or freezing varieties are discussed. Wisconsin Merit was the most productive canning, and Glacier the most productive market-garden sort. Thomas Laxton was found the best freezing variety. Based on tenderometer readings, Chief and Improved Gradus were the most tender in the respective groups.

Descriptions of types of principal American varieties of spinach, R Magruder, V. R. Boswell, G. W. Scott, P. Work, and L. R. Hawthorn. (Coop. Calif. and Tex. Expt. Stas. and Cornell Univ.). (*U. S. Dept. Agr., Misc. Pub. 316 (1938), pp. 60, pls. 28, fig. 1*).—Based on cooperative studies conducted at

Ithaca, N. Y., Rosslyn, Va., Winter Haven, Tex., and Davis, Calif., in which plants were grown from seed of the same strains, descriptive data are presented on Virginia Savoy, Old Dominion, Dark Green Bloomsdale, Long Standing Bloomsdale, Juliana, King of Denmark, Viroflay, Nobel, Hollandia, and Amsterdam Giant varieties. In particular, there is pointed out the influence of environment on the different growth characters. The appendix contains tabular data on the effects of the different environments and detailed measurements of plants as recorded at the four locations.

A statistical analysis of form variations in specific strains of tomatoes, W. H. LACHMAN, E. A. WEST, and G. B. SNYDER. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 559–561*).—Data on the shape indexes of 10 varieties of tomatoes taken from individual clusters harvested throughout the season showed no consistent changes in shape with the advancing season. It was apparent that the smaller fruits tend to be more globular and symmetrical in shape. It was evident that 30 fruits constituted an adequate sample under the conditions of the study.

Present cultural methods in growing the spring greenhouse tomato crop in Ohio, I. C. HOFFMAN (*Ohio Sta. Bimo. Bul. 195 (1938), pp. 196–204, fig. 1*).—Information is presented as to varieties, soils and their preparation, fertilizers, growing of plants, cultural care, heat and water requirements, etc.

The development and fruiting of tomato plants in the field as influenced by date of planting, H. L. STIER and W. A. FRAZIER. (Univ. Md.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 578–584, fig. 1*).—Records taken on Marglobe tomato plants set in the field on May 8, May 21, June 7, June 20, and July 15 showed the greatest production of dry matter in above-ground portions and the highest yields of ripe fruit in the two earliest plantings. Leaf size was significantly smaller throughout the season on plants of the last three plantings. Defoliation began in from 65 to 80 days in all lots, and in general was progressively less with each successive planting. The number of days from anthesis to the pink fruit stage was apparently influenced greatly by prevailing temperatures, being the least in the June 7 lot. There was a tendency for the percentage of blossoms developing into fruits to decline with the later plantings.

Some effects of nitrogen fertilization on greenhouse tomatoes, W. B. MACK. (Pa. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 661–667*).—On plats comparably treated with inorganic nutrients, well-rotted horse manure spaded into the soil before steam pasteurization just before setting the fall crop of Marglobe plants had no significant effect, even when applied at the approximate rate of 50 tons per acre, on yields of the fall crop, but did increase the mean weight of fruits in the spring crop. Nitrate readings on soil samples from the upper 4 in., collected in December and June, were surprisingly low except on plats with very high initial nitrogen treatments and on those supplied every other week with supplemental nitrate of soda. In the spring crop, nitrogen applications increased the weight of fruit in every instance, with or without manure, even up to the largest amounts applied. In general, the percentages of first-grade fruits were somewhat greater on the highest-yielding plats. The growth of plants in the spring crop was influenced greatly by nitrogen and manure, but no evidence was seen of overvegetativeness in any plat.

Early fruiting of tomatoes as induced by the use of soluble phosphate, C. E. BAKER (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 668–672, figs. 3*).—The addition of phosphoric acid or monoammonium phosphate to the water used at the time of transplanting tomato plants resulted in increased growth, as compared with the checks receiving water alone. The monoammonium phosphate treatment resulted in the greatest growth, largest yields prior to September 1, and the largest total yields. All treatments increased yields in the early part of the season. Observations in other growers' fields gave similar indications, namely, that on soils relatively low in available phosphorus, diluted phosphoric acid used at transplanting time is effective. Phosphoric acid increased both early plant growth and the early fruit production of peppers.

Some effects of waxing tomatoes, C. Brooks. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), p. 720, fig. 1*).—The skin of mature tomatoes is said to be practically impermeable to gases, exchange occurring almost entirely through the stem scar. Waxing the stem scar more than doubled the time that green mature fruits could be held at 70° F. before ripening and had an inhibiting effect on coloration equal to a drop in temperature to 50°. Flavor and quality of scar-treated tomatoes were similar to that of normal fruit, the ripening of which was equally delayed by lowering the temperature. Leaving short stems increased definitely the carbon dioxide of the internal atmosphere and delayed ripening.

Annual report of Minnesota Fruit Breeding Farm, W. H. Alderman and F. E. Haralson (*Minn. Hort., 66 (1938), No. 10, pp. 183, 184*).—Notes are presented on general activities and on certain promising apple, plum, strawberry, grape, and other seedlings.

Results with methods of deep-soil culture in West Virginia orchards, R. H. Sudds. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 295–301*).—Attempts to improve the condition and water-retaining capacity of shallow orchard soils by dynamiting and by the use of the Killefer subsoiler led to negative or unimportant results. In some soils dynamiting reduced tree growth slightly, as indicated by trunk girth increments, and in other orchards there was some increase. In the case of large trees, root pruning by the Killefer plow may have offset the beneficial effects of temporarily increased moisture penetration.

Distribution of nitrate nitrogen in the upper twelve inches of a cultivated orchard soil, C. E. Baker. (Purdue Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 293, 294*).—On three occasions in August 1937, samples were collected at successive 2-in. depths in the upper foot of soil in a cultivated orchard at LaFayette, Ind. The plat had received in late March an over-all application of sulfate of ammonia at the rate of 400 lb. per acre. On August 3, when only 1.2 in. of rain had fallen since July 18, there were found 28.4, 12.8, 12.8, 8.5, 6.7, and 4.9 p. p. m. in the 2-in. layers from top downward. Similar results were secured in the other two samplings except that when more rain fell in one case there was noted a definite downward movement of the nitrates.

Carbon dioxide storage of apples, pears, plums, and peaches, F. W. Allen and R. M. Smock. (Univ. Calif. and Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 193–199*).—Supplementing an earlier report (E. S. R., 74, p. 490), information is given on storage of apples, pears, peaches, and plums in atmospheres containing increased amounts of carbon dioxide. With 10 percent CO_2 and 45° F., Yellow Newtown apples were held approximately as green and firm as at from 32° to 36° in air, and all internal browning was avoided. Similar results were obtained with the Yellow Bellflower apple and the Bartlett and Hardy pears. Essentially the same results were secured in airtight cabinets where CO_2 increased and O_2 decreased in the natural processes of respiration, and good results with peaches and plums held for 10 days in an increased CO_2 atmosphere. Exposure for 6 days to CO_2 concentrations of from 20 to 80 percent retarded ripening markedly, but the time needed for subsequent ripening was more than doubled. Pectin changes were much more closely correlated with the different CO_2 treatments than were changes in sugars and acids.

Correlation of trunk circumference increase and length of terminal growth with yield of apples, E. L. OVERHOLSER, F. L. OVERLEY, and L. M. BARNHILL. (Wash. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 263–268*).—Records taken on Winesap trees in central Washington indicated that when trunk girth increment is used as a measurement of vigor of growth, the trees making the greatest development in any one given year may be expected to produce the most fruit the succeeding year. In the case of Jonathan, the odds for significance were not as conclusive, and in both varieties there was a tendency for the trees to make a longer average terminal growth in their year of heavy production.

The effect of nitrate of soda and sulphate of ammonia on soil reaction and root growth of apple trees, L. P. BATJER and R. H. SUDDS. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 279–282*).—Observations by soil samples and trenching on 10 pairs of Arkansas (Black Twig) trees 25 yr. old in 1926 when the treatments began showed very clearly that 11 yr. of fertilization with nitrate of soda or sulfate of ammonia had influenced root growth and soil condition. In at least 5 of the pairs the root weight of the nitrated trees was more than double that of the trees receiving sulfate of ammonia. The roots of the nitrated trees were fibrous, while those of the sulfated trees were stringy and coarse. There were pronounced color differences in the roots. In the surface 5 in. of soil, the pH of the nitrated area was decidedly more alkaline, with an average difference of 2.3 pH. The pH difference lessened as the depth increased. The percentage of aggregate and particles less than 0.05 mm in diameter was significantly greater in the soil receiving nitrate of soda. The possibility that H-ion concentration was sufficiently low to injure the roots under the sulfated trees was indicated.

The effects of varying amounts of nitrogen, potassium, and phosphorus on the growth and assimilation of young apple trees, L. P. BATJER and E. S. DEGMAN. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), p. 255*).—Observations on 1-year-old York Imperial trees grown in the greenhouse in sand cultures showed that 60 p. p. m. of nitrogen resulted in somewhat less growth than did 168 p. p. m. Below 60 p. p. m., growth was reduced almost quantitatively. In the potassium series, 10 p. p. m. did not produce definite deficiency symptoms, although increased growth occurred until more than 60 p. p. m. were supplied. In the phosphorus series, growth was approximately uniform in all trees receiving 4 p. p. m or more. Visible phosphorus deficiency symptoms were not reached until no phosphorus was supplied. Rate of photosynthesis per unit leaf area was not significantly reduced in the phosphorus series until 0 was reached. Decreases in photosynthesis followed each reduction in nitrogen and potassium. Supplying nitrogen to nitrogen-deficient trees resulted in marked improvement in color and increased the carbon dioxide assimilation within 7 days.

The influence of certain nutrients on the photosynthetic activity of apple leaves, N. F. CHILDERS. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 253, 254*).—Studies with seedlings growing in sand, soil, and cultural solutions and subjected to deficiencies of nitrogen, phosphorus, or potassium showed very marked influences of deficiencies on growth, particularly of the leaves. In the case of trees in soil, the application of nitrate of soda to nitrogen-deficient trees resulted in an increase in photosynthesis, transpiration, and improved leaf color. In sand culture, the absence of nitrogen caused by far the greatest reduction in the carbon dioxide assimilation and in transpiration. There were no significant effects on the rates of photosynthesis and transpiration in the case of phosphorus- and potassium-deficient plants. A lack of nitrogen in cultural solutions resulted in a reduction of from 42 to 69 percent in chlorophyll as compared with full-nutrient plants. A lack of potassium in some cases caused a slight increase, and a lack of phosphorus had little effect on chlorophyll content. Where seedlings were shifted after 1.5 mo. in full-nutrient cultures to deficient cultures, the lack of potassium showed the earliest and greatest reduction in photosynthesis. Trees shifted to minus potassium developed relatively poor root systems.

How lime sulphur spray affects the photosynthesis of an entire ten year old apple tree, A. J. Heinicke. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 256–259*).—In the case of an entire Baldwin tree enclosed in a glass chamber, during the 5 days following the first spraying on the night of July 6–7, the foliage was only about one-half as active photosynthetically as during the preceding 6 days. Within 15 days the tree apparently recovered, and some new unsprayed leaf surface was formed. The second spraying on the night of July 21–22 was again followed by an appreciable but not as severe reduction in activity. Apparently, harmful effects were related to temperature following treatment. The severe pruning given the enclosed tree prior to treatment may have modified this response to spraying by exposing a larger portion of the remaining leaf surface to full light and by encouraging the development of new leaves.

The morphology of the apple flower and fruit, L. H. MacDaniels. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), p. 116*).—A critical study of the vascular anatomy of the apple, pear, and quince and related genera indicated that the complex structure found in the pomes has arisen phylogenetically by the fusion of sepals, petals, and stamens that were once free. The apple may be described as a fleshy accessory fruit made up of a five-carpelled ovary with cartilagenous endocarp and fleshy exocarp united with a fleshy tube or disk made up of the fused bases of the sepals, petals, and stamens.

Histology of apple fruit tissue in relation to cracking, L. Verner. (Idaho Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 11, pp. 813–824, pls. 6*).—Studies of sections of fruit tissue of the highly susceptible Stayman Winesap and of comparable tissues of the resistant varieties, such as Grimes Golden and Winter Banana, showed definite tendencies for premature cessation or retardation of growth in the peripheral tissue of the susceptible varieties. This was especially evident in fruits already cracked or showing abnormalities commonly associated with cracking. In the epidermis of both susceptible and nonsusceptible varieties, the cells were separated into small groups, and the intervening spaces filled with cutin which preserved the continuity of the epidermal layer. In Stayman Winesap, the hypodermal layer of cells showed, by marked tangential elongation, evidence of inadequate growth late in the season. In noncracking varieties, the hypodermal cells were nearly isodiametric in cross section. The author proposes that susceptibility of the Stayman to cracking is due primarily to premature cessation or restriction of growth in the hypodermal layer.

A characteristic localization of the arsenical browning of apples, W. A. Ruth. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 161–164, fig. 1*).—The application of drops of solution or suspension of arsenicals alone and with dilute hydrochloric acid to the surface of unsprayed apples, from 1 to 5 weeks before picking maturity, led to some interesting observations on the nature of the resulting injury. Where hydrochloric acid was applied alone in three concentrations, 1.25 percent, 0.125 percent, and 0.0125 percent by weight, the weakest solution caused no injury. With higher concentrations, injury varied with varieties, location on the fruit, and stage of maturity. The arsenicals, except arsenic acid, usually failed to produce injury unless hydrochloric acid was also applied. Penetration into the apple tissue was considerably slower under the sodium arsenate or lead arsenate-hydrochloric acid mixtures than under hydrochloric acid alone. However, with arsenic acid or combined arsenates and hydrochloric acid, discoloration did not abruptly cease as with hydrochloric acid alone but continued until the entire end of the apple turned brown.

The effects of water supply to the tree upon water content, pressure test, and quality of Bartlett pears, A. L. Ryall and W. W. Aldrich. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 283–288, figs. 2*).—Measurements at weekly intervals during the growing season and at harvest of the fruits of irrigated and nonirrigated Bartlett trees growing near Medford, Oreg., showed that reduced water supply followed by reduced rate of fruit enlargement resulted in decreased proportion of water to total solids in the harvested pears. The decreased water content was reflected in a higher pressure test during all except the end of the harvest period, when a more rapid softening of the dry-plat fruit occurred. The reduced water supply resulted in a less rapid development and less core break-down of fruits after ripening following cold storage.

The effect of fall nitrogen fertilization on the soluble nitrogen and phosphate phosphorus content of dormant peach twigs, C. S. Waltman. (Ky. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 273–278, figs. 2*).—Analyses of duplicate twig samples taken at weekly intervals from October 11, 1935, to April 2, 1936, from 9-year-old Elberta peach trees, some of which were fertilized on October 12 with sulfate of ammonia, nitrate of soda, or calcium cyanamide, showed an increase in percentage of soluble nitrogen, as compared with unfertilized checks, only in the case of sulfate of ammonia treatment. The calcium cyanamide and nitrate of soda treatments resulted in a decrease in soluble nitrogen as compared with the checks. In all cases, including checks, the average for soluble nitrogen during the 24 weeks was lower than in the trees before treatment. Apparently the increase in soluble nitrogen stimulated an increase in phosphorus utilization, since only in one case was phosphorus greater in fertilized trees. The average phosphate phosphorus content of the check trees and of those supplied calcium cyanamide showed a net gain during the 24-week period, while the other treatments gave a decrease.

Seedless peaches as a result of freezing injury, L. Havis (*Ohio Sta. Bimo. Bul. 195 (1938), pp. 214–219, figs. 3*).—Exposure of young peach fruits, from 12 to 15 mm in length, to freezing temperature on the morning of May 12 was followed by an extremely heavy drop between 10 and 15 days later. Of the remaining fruits, many continued on to marketable maturity despite the fact that a large percentage were found to contain dead embryos. There was a tendency for fruit with dead embryos to be smaller than perfect fruits. No difference was observed in time of ripening of fruits with or without living seeds. Although many peaches were malformed by freezing injury to the flesh, there was no correlation with injured seeds. Little difference was noted in the development of the endocarp or stones in the fruits with or without living embryos.

Responses of fruit trees to comparatively large amounts of available moisture, A. H. Hendrickson and F. J. Veihmeyer. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937) pp. 289–292, fig. 1*).—French prune trees subjected to two different moisture treatments—A, irrigated whenever soil moisture in the upper 3-ft. level reached a point about 3.3 percent above the permanent wilting percentage, and B, irrigated when the permanent wilting percentage was reached, yielded almost identically over the 5-yr. period, 1933–37. That quality was also equal was shown in nearly identical returns per acre. Measurements of the cross sections of the trunks showed a response to moisture in that the trees on A plat were larger in 1937 although smaller in 1933 before the treatments had begun. Concord walnuts grown under differential moisture conditions failed also to show any material response in yield or in size of nuts.

Strawberry growing in Kansas, R. J. Barnett (*Kansas Sta. Circ. 193 (1938), pp. 19, figs. 10*).—General information is offered on varieties, the location of beds, planting, cultural requirements, mulching, bed renewal, harvesting and marketing, etc.

Promising new grapes, F. E. Gladwin (*Farm Res. [New York State Sta.], 5 (1939), No. 1, pp. 7, 8*).—In discussing the objectives of grape breeding at the Fredonia Laboratory, the author describes some of the more promising new varieties that have been developed, such as Fredonia, Van Buren, and Westfield.

Utilization and storage of Florida grapes, O. D. Abbott and K. W. Loucks (*Florida Sta. Bul. 329 (1938) pp. 14*).—In these studies the variety Beacon was used in storage experiments, and 10 varieties were tested for table use and for jelly and juice making. The varieties under test did not contain sufficient pectin for commercial jelly making but were valuable for preparing jellies and jams for home use. Juice of excellent quality was prepared from certain varieties, especially the Wapanuka, also most desirable for table use. None of the juices had the high color of the Concord grape, but it is believed that intrinsic quality would offset color prejudice.

Beacon grapes were held satisfactorily for 30 days at 37° F. Treatment with sulfur dioxide delayed deterioration in storage for about 30 days, but thereafter the treated fruits showed greater loss from infections than the controls. Grapes could be held for as many as 60 days in commercial cold storage but had to be used promptly thereafter. Observations on the grapes treated with sulfur dioxide, sodium bisulfite, and borax and held at room temperature showed these materials to be ineffective for maintaining keeping quality. Grapefruit juice (1 part to 4 of water) was effective in removing spray residues from grapes.

Chemical determination of maturity in grapes (*Farm Res. [New York State Sta.], 5 (1939), No. 1, p. 10*).—Stating that neither color nor appearance offers a sound basis for determining maturity in grapes, there is presented a discussion of the value of sugar and acid readings and of the need of a simple and rapid method that would be available to the growers.

The effects of soil reaction on the growth and chemical composition of annual garden flowers, G. M. Shear (*Virginia Sta. Tech. Bul. 63 (1938), pp. 34, figs. 7*).—By the application of ground limestone on the one hand and aluminum sulfate or sulfuric acid on the other, soil of an original average pH of 5.3 was modified to include a series of plats ranging from 4.5 to 7.5 pH. On these were grown 19 species of annual garden flowers. All grew well at pH 7.5, suggesting that with the possible exception of phlox, petunia, lupine, and cornflower the upper limits of favorable soil reaction were not reached. In presenting the favorable pH for the various species, the author asserts that in general a reaction of between 6 and 7 pH is most favorable. Sap analyses failed to reveal any instance where the soil reaction induced a deficiency in Ca, Mg, K, P, or nitrate or ammonia N. Ca and K tended to increase in the sap as the pH of the soil decreased, while Mg increased as the pH of the soil increased.

Available Fe, Al, and Mn increased in the soil as the soil became more acid, whereas the available P showed no correlation with soil pH. The total amount of Mn in plants grown under the different treatments increased with a decrease in pH, whereas Al and Fe showed no such correlation. The application of monocalcium phosphate at the rate of 2 5 tons per acre to the pH 4.5 soil did not affect soil reaction nor the amount of available Mn or Fe in the soil. The amount of soluble Al was decreased and that of available P increased. Plant growth and the P in the sap were increased, while nitrate N and K were decreased. The indications were that Al was responsible for the detrimental effects of low soil pH under the conditions of the experiment.

Some results with rapid tests on rose, carnation, and gardenia soils, F. F. Weinard. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 855–857*).—Based on the results of analyses of samples of soil collected from experimental greenhouses and from commercial florist ranges, suggestions are offered as to desirable amounts of N, P, and K and the desirable degree of acidity for the production of roses, carnations, and gardenias. The suggested pH ranges for the three species, respectively, were from 5 to 6, from 6 to 7, and from 4.5 to 5.5.

The effect of pasteurization and manure treatments on virgin carnation soil, W. E. Gunesch. (Colo. State Col.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 807–809*).—Patrician carnations grown in (1) virgin prairie soil, (2) virgin soil plus manure, (3) virgin soil pasteurized, and (4) virgin soil plus pasteurized manure, responded to the additions of manure in either form. With respect to stem length, treatment (2) resulted in significantly longer stems than did treatments (1) and (3). There was some tendency for manure to retard early plant development.

Sex abnormalities in carnation flowers, A. J. Szendel. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 748–754, figs. 3*).—Detailed descriptions are presented, with discussion, of the modified floral structures found in examination of greenhouse-grown flowers, some with normal and some with split calyxes.

Calyx splitting of carnation flower.—Preliminary report on nutritional experiments, A. J. Szendel. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 781–787*).—There was noted a consistent relationship between fertilizer treatment and the occurrence of split calyxes in the carnation varieties Joan Marie and My Love. Weekly applications of full-nutrient solutions almost doubled the percentage of splits as compared with bimonthly applications. Total amounts being equal, more splitting occurred with the more frequent applications. Since the —P nutrition completely prevented splitting, there was evidence that P nutrition is an important factor.

Results of selfing twenty-four early blooming chrysanthemums, F. L. Mulford. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 818–821*).—Observations on seedlings resulting from the selfing of four selected stocks showed a marked variation in habit of growth, color of foliage, time of flowering, color of flowers, etc. Apparently, the time of bloom is a rather complex characteristic in the chrysanthemum since in all four populations the seedlings ranged more widely than did the parents. Only one of the four populations was homozygous for flower type, single. Segregations for flower size and color were so extensive as to indicate great heterozygosity in the parental material.

Further microchemical studies on flower bud differentiation in relation to the photoperiod, C. Link. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 810–814*).—From further studies (E. S. R., 79, p. 484), the author reports that neither the nitrate nitrogen content of the soil nor the nitrate nitrogen, ammonium nitrogen, protein, starch, and reducing sugars in the plant had any significant effect on flower-bud initiation and development in the chrysanthemum. Only a trace to small amount of nitrogen was observed in the tips of the high and medium nitrogen plants. Starch was moderate to abundant in the tips of all plants regardless of treatment, decreasing as the flower buds developed. In the short-day group, reducing sugars decreased from abundance to none from 7 to 10 days after treatment. However, a subsequent increase was noted, followed by a decrease as flower buds appeared.

Pollen studies in chrysanthemums with reference to fertility, F. L. MULFORD. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 815–817*).—Observing that plants isolated in cloth cages yield little or no viable seed, the author examined the pollen collected from plants grown in a greenhouse at from 50° to 60° F. Of the 36 varieties and seedlings studied, 32 produced pollen over 80 percent viable. Most of the plants set a good crop of seed, although there were a few highly sterile forms.

Dahlia variety test, 1938, H. L. COCHRAN, D. D. LONG, and N. LAMOTTE (*Georgia Sta. Circ. 116 (1938), pp. 11, figs. 15*).—Descriptions are presented of 23 varieties selected from among 136 under trial in 1938.

Propagation studies with geraniums, H. E. WHITE. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 795–800, figs. 2*).—Among various factors concerned in the loss of geranium cuttings taken in late autumn, temperature was found most important. At 60° F., more than 90 percent rooting occurred, more than twice that obtained at 80°. Stem rot diseases, important factors in the losses, were favored at the higher temperatures. The kind of media had little influence on rooting. Steam sterilization of the soil and treatment of cuttings with potassium permanganate did not reduce losses from rots. Synthetic substances had some effect on rooting, but not in the presence of rots. Bordeaux mixture spray was actually detrimental.

Woody plants with ornamental fruits, C. H. CONNORS (*New Jersey Stas. Circ. 380 (1938), pp. 23, figs. 6*).—Classified lists are presented of various fruit-bearing ornamentals, with special attention to height of mature plants, color of flowers and fruits, time of their appearance, etc. In addition, there are included general cultural notes.

Root distribution studies, L. C. CHADWICK, D. BUSHEY, and G. PLETCHER. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 734–738, figs. 2*).—Observations on *Carpinus japonica* seedlings grown in pots of clay, loam, muck, and sand, and various combinations thereof, showed the soil medium to exert a profound influence on both top and root development. Plants in muck had the largest and most compact root and top systems. Native American elms were found to be very shallow rooted. Moline elms had no taproots, but as the trees developed in size more anchor roots extended into the deeper soils.

FORESTRY

Shelterbelt planting reduces wind erosion damage in western Oklahoma, J. H. STOECKELER. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 11, pp. 923–931, figs. 5*).—Observations in an area with a mean annual rainfall of about 27 in., falling largely between April 1 and September 30, and where the principal crops are cotton and sorghum, showed that windbreaks planted at right angles to the most destructive winds and supplemented with a system of strip cropping were very helpful in reducing wind erosion losses. Single or double rows of cottonwood or mulberry were practically as effective as windbreaks of from 10 to 15 rows. On sandy soils, found much more favorable to tree growth than silt or clay loams, trees retained good vigor for from 30 to

50 yr. Effective regeneration was apparently affected by exhaustion of the subsoil moisture.

Forest cover retards snow melting, G. S. MEAGHER (*Jour. Forestry, 36 (1938), No. 12, pp. 1209, 1210*).—Observations in southern Washington at three stations established in (1) an area clear cut in 1930, (2) a partially cut area, and (3) a virgin stand of Douglas fir and hemlock showed that snow disappeared in the open 1 and 2 weeks earlier, respectively, than in the partially cut and virgin stands.

Comparative infiltration in forest and open, J. KITTREDGE, JR. (Univ. Calif.). (*Jour. Forestry, 36 (1938), No. 11, pp. 1156, 1157*).—Determinations of the infiltration of moisture at two locations on a ridge lying just east of Berkeley, Calif., (1) in an open firebreak and (2) in a 25- to 30-year-old Monterey pine plantation showed almost four times as much water entering the forest soil as the soil in the open.

The history of shipmast locust, O. RABER. (U. S. D. A.). (*Jour. Forestry, 36 (1938), No. 11, pp. 1116–1119*).—The author concludes that the origin of the shipmast locust is obscure and that when and by whom it was introduced to Long Island is unknown.

Observations on a plantation of Dunkeld hybrid larch in New York, E. W. LITTLEFIELD and E. J. ELIASON (*Jour. Forestry, 36 (1938), No. 12, pp. 1188–1192, fig. 1*).—A small planting established in Montgomery County, N. Y., in 1932 showed considerable variation in type, including the Japanese, European, and intermediate forms. Since the European and intermediates showed much more vigor and may be distinguished at an early stage, the authors suggest their selection. In spite of droughts and cold winters, the trees had made satisfactory growth.

Soil adaptability of white spruce, J. H. STOECKELER. (U. S. D. A. and Univ. Minn.). (*Jour. Forestry, 36 (1938), No. 11, pp. 1145–1147*).—Usually classified as adapted to acid soils, white spruce was found much more lime tolerant than supposed, growing on highly calcareous soils in the province of Manitoba, Canada, and elsewhere.

Methods of stratification for loblolly pine seeds, A. L. MACKINNEY and W. E. MCQUILKIN. (U. S. D. A.). (*Jour. Forestry, 36 (1938), No. 11, pp. 1123–1127*).—Among findings were that the stratification medium must be thoroughly moist and that dry stratification is neither more nor less effective than is exposure of seeds in an open pan under the same conditions of temperature and time. Peat and sand were equally effective mediums, and for practical purposes it is advised that loblolly pine seeds should be stratified for from 2 to 3 mo. in thoroughly moistened sand or peat at temperatures between 32° and

Direct seeding in the northern Rocky Mountain, S. L. TINSLEY. (Univ. Idaho). (*Jour. Forestry, 36 (1938), No. 11, pp. 1158–1160, figs. 2*).—Preliminary experiments indicated that the use of screens and other devices for rodent protection may permit successful reforestation by direct seeding at a cost equal to or below that of planting. Fall-seeded spots of *Pinus monticola* protected by screens showed a first-year establishment of 76.3 percent, with an average of 1.6 seedlings per spot. Spring seeding of previously stratified seed with rodent protection also gave favorable results.

Use of protective screens in seed-spot sowing found to serve two-fold purpose, H. KRAUCH. (U. S. D. A.). (*Jour. Forestry, 36 (1938), No. 12, p. 1240*).—Some evidence was secured that screen cloth of No. 3 mesh was helpful not only in excluding predatory birds and animals but also in providing partial shade for the tender seedlings.

The effect of season of planting and other factors on early survival of forest plantations, R. K. LeBarron, G. Fox, and R. H. Blythe, Jr. (U. S. D. A.). (*Jour. Forestry, 36 (1938), No. 12, pp. 1211–1215*).—In a study conducted on the Superior National Forest with 2–0 red pine planted on heavy, medium, and light soils, it was found that spring planting gave significantly higher survival than did fall planting. With both seasons combined, survival was significantly better on brushy than on open sites. Mulching of fall plantings with grass and leaves did not give higher survival. In the spring plantings the best survival occurred on the heavier soils, while in fall plantings the reverse was true.

Relationships between vigor of resprouting and intensity of cutting in coppice stands, S. Little, Jr. (*Jour. Forestry, 36 (1938), No. 12, pp. 1216–1223*).—In a mixed oak-pine stand in Burlington County, N. J., it was observed that three factors—size of trees cut, species, and severity of the thinning—influenced the characteristics of the sprouts. The size of the trees was the most important factor in determining the average length of the living sprouts and the total number of sprouts per cut tree. The species was the most potent factor in affecting the number of living sprouts per cut tree, in fact species had nearly twice as much influence as did treatment. Rated in persistence of sprouts, the oaks ranked as follows: Post, white, chestnut, black, and scarlet.

Does freezing injure planting stock? (U. S. D. A. and Univ. Minn.). (*Jour. Forestry, 36 (1938), No. 12, pp. 1244, 1245*).—At the Lake States Forest Experiment Station, St. Paul, Minn., small bundles of planting stock exposed for 18, 24, and 72 hr. in a freezing chamber to 14° F. were found in some cases to have suffered severe injury. Jack pine was not injured, but white spruce suffered from 40 to 50 percent death and from 15 to 20 percent slight injury from the 14° exposure. Even in the control chamber at 41° storage, white spruce suffered material injury. The number of hours in the chambers had no effect on losses.

Squirrel damage to sample plot tags, D. D. Stevenson. (Pa. State Col.). (*Jour. Forestry, 36 (1938), No. 12, pp. 1242, 1243*).—Although aluminum tags were attached much more rapidly than marking with paint or stamps, the painting method is considered much more advisable where squirrels are abundant because of their tendency to chew and destroy the tags.

Snowshoe hare useful in thinning forest stands, W. T. Cox. (U. S. D. A.). (*Jour. Forestry, 36 (1938), No. 11, pp. 1107–1109*).—Evidence is presented to show that the snowshoe hare is an important agent in thinning the dense seedling stands of jack pine, aspen, and other species in northern Minnesota. Without such thinning, the author believes that the thickets would stagnate for long periods before the final stand would assert its dominance. As the hares open up the stands the animals become exposed to their natural enemies and are killed or forced to desert the area before complete extermination of the stand occurs.

Sampling error in timber surveys, A. A. Hasel. (U. S. D. A. and Univ. Calif.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 10, pp. 713–736, figs. 5*).—The heterogeneous nature of variation in board-foot volume in a 5,760-acre area of pine timber type in northeastern California was shown by the use of Fisher's method of analysis of variance. The analyses were based on a 100-percent inventory. The effects upon sampling error of size, shape, arrangement of plats, and intensity of sampling were determined theoretically and checked against actual results from samples taken according to the specifications set up. The smallest size of plat, 2.5 acres, was a more efficient sampling unit than plats of larger size, and long, narrow plats were more efficient than those approaching the square shape. A valid estimate of sampling error was possible only by selecting the sampling units independently and at random. By dividing the area into blocks of uniform size and shape, and selecting equal numbers and at least two random sampling units in each, a significant reduction in error variance was obtained as compared to unrestricted random selection. Cruises with plats arranged in a systematic pattern gave somewhat closer estimates of true volume than did corresponding random cruises, but did not contain the information needed for assessing sampling error. A combination of random and systematic cruising is recommended.

DISEASES OF PLANTS

Abstracts of papers presented at the thirtieth annual meeting of the American Phytopathological Society, Richmond, Virginia, December 27 to 30, 1938, inclusive (*Phytopathology, 29 (1939), No. 1, pp. 1–25*).—Abstracts of the following papers are included: Studies on *Septoria bromigena*, by J. L. Allison; Effect of Nutrient Variations on Host and Parasite in the *Rhizoctonia* Stem Rot Disease of Bean, by E. J. Anderson; The Factorial Interpretation of Anthracnose Resistance in Beans, by C. F. Andrus; Pathogenicity Experiments With Isolates of *Fusarium vasinfectum* Causing Cotton Wilt, by G. M. Armstrong, J. D. MacLachlan, and R. Weindling; Movement of the Virus of Tobacco Mosaic, by C. W. Bennett; The Effect of Insect Juices on the Infectivity of Plant Viruses, by L. M. Black; Decay of Hardwoods by *Ustulina vulgaris* and Other Ascomycetes, by D. J. Blaisdell; The Response of *Phymatotrichum omnivorum* to Heavy Metals and Other Elements, by L. M. Blank; Natural Water-soaking and Bacterial Infection, by A. C. Braun and J. Johnson; Two Distinct Viruses From the Mosaic Complex in *Lilium longiflorum*, by P. Brierley; Marsh Spot of Peas Caused by Manganese Deficiency, by H. L. G. de Bruyn; *Daedalea unicolor* on Maples and Other Hardwoods, by W. A. Campbell; Sterile Conks of *Polyporus glomeratus* and Associated Cankers, by W. A. Campbell and R. W. Davidson; Effect of Temperature on Infection and Development of Eight Physiologic Races of *Puccinia graminis tritici* on Wheat Seedlings, and Effect of Temperature on Urediospore Germination and Germ Tube Development of Five Physiologic Races of *Puccinia graminis tritici*, both by R. C. Cassell (U. S. D. A. and Minn. Expt. Sta.); Source of Leaf-Rust Inoculum for Fall Infection of Wheat, by K. S. Chester; Heat Treatments of Black Locust for Root-Knot Control, by K. S. Chester and M. Cress; Fungicidal Studies With Special Reference to the Vegetable Oils, by E. E. Clayton and H. H. Foster; White Root Rot of Apple Trees (*Corticium galactinum*), by J. S. Cooley and R. W. Davidson; The Hawkesbury Watermelon, a Promising Wilt-Resistant Variety, by H. T. Cook and T. J. Nugent; Two Years Experiments in the Control of Cherry Leaf Spot (*Coccomyces hiemalis*), by R. H. Daines; A Study of the Yellow Mosaics of Potato, by T. P. Dykstra (U. S. D. A.); Psorosis in Relation to Other Virus-like Effects on Citrus, by H. S. Fawcett; Early Planting, an Aid in the Control of Onion Smut, by E. L. Felix; Yield Reduction by Lime Sulphur on Apple Trees, by D. Folsom; Immunization of Sugarcane as a Basis for Determining Validity of Virus Classification, and Production of Setae by *Colletotrichum falcatum* in Culture, both by I. L. Forbes; Effect of Environment on Metabolism of Tomato Plant as Related to Development of Blossom-end Rot of the Fruit, by A. C. Foster; Physico-Chemical Studies on the Tobacco-Mosaic Virus Protein, by V. L. Frampton; The Fungicidal Activity of Phenothiazine and Some of Its Oxidation Derivatives, by M. C. Goldsworthy and E. L. Green; *Fusarium* Species Associated With Diseases of Cereals in Manitoba, by W. L. Gordon; Systemic Brooming of *Robinia pseudoacacia* and Other Virus-like Diseases of Trees, by T. J. Grant; The Epidemiology of Seedborne Microorganisms in Cereals, by F. J. Greaney and J. E. Machacek; Observations on the Supposed Colloidal State of Sulphur in Fused Bentonite Sulphur, and Particle Size of Elementary Sulphur Fungicides, both by A. B. Groves; A Red Forcing Tomato Resistant to *Cladosporium* Leaf Mold, by E. F. Guba; The Effect of Various Soil Amendments on the Development of Club Root (*Plasmodiophora brassicae*) of Crucifers, by C. M. Haenseler; Cultural Studies on a Species of *Entomophthora* From the Apple Leaf Hopper (*Typhlocyba pomaria*), by J. G. Harrar, L. I. Miller, and S. A. Wingard; Physiologic Races of the Fungus Causing Bean Rust, by L. L. Harter; The Clonal Variety for Tree Planting—Asset or Liability? by C. Hartley; Yellow Cuprous Oxide as a Fungicide of Small Particle Size, by J. W. Heuberger and J. G. Horsfall; Red Leaf Disease of Grapes in California Cured by Controlling Mites, by W. B. Hewitt, H. E. Jacob, E. L. Proebsting, and J. F. Lamiman; A Transmissible Disease of Grapevines, by W. B. Hewitt; Internal Bark Necrosis of Delicious Apple, a Physiogenic "Boron-Deficiency" Disease, and Two Fungi (*Valsa leucostoma* and *V. cincta*) Besides Brown Rot (*Sclerotinia fructicola*) Prominently Involved in Peach-Canker Complex, both by E. M. Hildebrand; Delayed Spraying of Tomatoes, by J. G. Horsfall and J. W. Heuberger; A Maple Blight in Rhode Island, by F. L. Howard and N. Caroselli; Chemical Control of Nematodes in Tomato Greenhouses, by F. L. Howard, F. L. Stark, and J. B. Smith; Bordeaux Mixture as a Summer Fungicide for Peaches, and Removal of Spray Residue With Sodium Hydroxide, Sodium Carbonate, and Acetic Acid, both by R. H. Hurt; Apparent Localization of Phony Disease Virus in the Woody Cylinder, by L. M. Hutchins; Promising Results of Heat Treatments for Inactivation of Phony Disease Virus in Dormant Peach Nursery Trees, by L. M. Hutchins and J. L. Rue; White Rust of Spinach, by S. S. Ivanoff; The Relation of Copper Fungicides to Lead Arsenate-Lime and Fixed Nicotine-Oil Sprays, by K. J. Kadow, M. W. Goodwin, and S. L. Hopperstead; Calomel as a Soil Treatment for the Control of Potato Scab in Michigan, Long Island, and New Jersey Soils, by G. KenKnight; Spraying Experiments for Control of *Coccomyces* Leaf Spot of Sour Cherry, by G. W. Keitt and C. N. Clayton; Stony Pit, a Transmissible Disease of Pears, by J. R. Kienholz; Physiologic Specialization in *Fomes lignosus*, by T. H. King; The Occurrence of Lysis in Certain Crosses of *Sphacelotheca sorghi*, by T. Laskaris; Some Recent Disease Developments in Forest Tree Nurseries, by D. H. Latham and W. C. Davis; Mycorrhizae and Pseudomycorrhizae on Pines, by D. H. Latham, K. D. Doak, and E. Wright; Further Experiments on the Cause of "Purple-top Wilt" of Potatoes, by J. G. Leach; Influence of Moisture and Other Factors on the Efficiency and Safety of Sugar-Beet Seed Treatment, and Practical Application of Indexing for *Sclerotium rolfsii* Infection on Sugar Beets and Some Modifying Conditions, both by L. D. Leach and B. R. Houston; A Bacterial Wilt of Lespedeza, by C. L. Lefebvre, T. T. Ayers, and H. W. Johnson; Hyperauxony of Nodules of *Phaseolus vulgaris*, by G. K. K. Link and V. Eggers; Production of Growth Substance on Peptone Broth by Crown-gall Bacteria and Related Non-gall-forming Organisms, by S. B. Locke, A. J. Riker, and B. M. Duggar; An Analysis of Factors Causing Variations in Spore Germination Tests of Fungicides, by S. E. A. McCallan and F. Wilcoxon; Some Further Experiments With Seed Disinfection in Cereals, by J. E. Machacek and F. J. Greaney; Comparative Studies on Two Genotypes of *Nicotiana tabacum* Resistant to *Nicotiana* Virus 1, by H. H. McKinney; Invasiveness of *Phytomonas stewarti* in Sweet Corn Supplied With Different Amounts of Nitrogen, by G. L. McNew and E. L. Spencer; X-Ray Diffraction Study of Tobacco Mosaic Virus Proteins Prepared by the

Sodium Sulphate Method, by D. K. McReynolds, N. S. Gingrich, and C. G. Vinson; Pathogenicity of Actinomycete Isolates on Sweet Potato, by W. J. Martin and L. H. Person; A Disease of *Gloxinia* Caused by *Phytophthora cryptogea*, by J. T. Middleton and C. M. Tucker; Control of *Cercospora* Leaf Spot of Peanut With Copper and Sulphur Fungicides, by L. I. Miller, E. T. Batten, and S. A. Wingard; Apple Rusts in Relation to Varietal Susceptibility, by P. L. Miller; Snapdragons Resistant to Two Races of *Puccinia antirrhini*, by R. Nelson; Progress in Control of Onion Mildew (*Peronospora destructor*) in New York, and Two New Electrical Devices for Pasteurizing Soil, both by A. G. Newhall; Adherence Properties of Copper Fungicides as Determined by Chemical Analyses and by Cataphoresis, by A. A. Nikitin; Chloropicrin as a Seed Disinfectant for Control of Black Rot of Kale, by T. J. Nugent and H. T. Cook; Seed Treatment for the Control of Bacterial Blight of Beans, by L. H. Person and C. W. Edgerton; Bacterial Leaf Spot of *Dieffenbachia*, by P. P. Pirone; *Cercospora* Leaf Spot of Strawberry, and A New *Mycosphaerella* Leaf Spot of Strawberry, both by A. G. Plakidas; Comparison of Thermal Inactivation Rates of Two Plant Viruses, by W. C. Price; A Rapid Reagent-Indicator Method for the Detection of the Mosaic Virus Agent in the Tobacco Plant, by A. J. Quirk; A Microchemical Study of Gum Pocket Formation in Sweet Cherry Wood, and Recent Findings Regarding the Buckskin Disease of Cherries, both by T. E. Rawlins; The Influence of Crown Gall and Hairy Root on Growth of Young Apple Trees, by A. J. Riker; Factors Affecting the Longevity of Urediospores of *Puccinia coronata avenae*, by H. R. Rosen and L. M. Weetman; A Non-transmissible Spindling Sprout of Potato, by E. S. Schultz; Effects of Different Dates of Transplanting Tobacco on the Control of Losses Caused by *Heterodera marioni*, by K. J. Shaw; Variability in *Fusarium vasinfectum*, by C. D. Sherbakoff (U. S. D. A. and Tenn.); Field Survey of the Relation of Susceptible Weeds to Granville-Wilt Control, by T. E. Smith and R. K. Godfrey; The Effect of Nitrogen Nutrition on Concentration of Tobacco-Mosaic Virus, by E. L. Spencer; Observations on Stem-Rust Epidemiology in Mexico, by E. C. Stakman, W. L. Popham, and R. C. Cassell (U. S. D. A. and Minn.); Influence of Environment, After Seedling Emergence, on Loose Smut of Oats and Covered Smut of Barley, by V. F. Tapke; Effects of *Ceratostomella ulmi* on *Ulmus americana* and Some Types of European Elm, by J. M. Walter; A Water-Culture Infection Method Used in the Study of *Fusarium* Wilt of Cotton, by R. Weindling and G. M. Armstrong; Mercuric Oxide as a Soil Antiseptic Against *Fusarium* Rot of Narcissus Bulbs, by F. Weiss and F. A. Haasis (U. S. D. A. and [N. Y.] Cornell); *Nectria* Canker in Relation to Growth and Mortality in Basswood (*Tilia americana*), by D. S. Welch; Differences in Cultural Characters and Pathogenicity of Strains of Tomato-Wilt *Fusarium*, by F. L. Wellman and D. J. Blaisdell; Results of Barberry Eradication in Pennsylvania, by L. K. Wright and R. S. Kirby; The Fungicidal Value of Cottonseed Oil and Some Other Spray Supplements, by C. E. Yarwood; Mycorrhizae of Red Pine (*Pinus resinosa*) in Relation to Their Environment and the Well-being of the Trees, by H. H. York; Chemical Soil Treatment to Control *Fusarium lycopersici*, *Heterodera marioni*, and Weeds, and Resistance of Tomato Varieties to *Fusarium lycopersici*, both by P. A. Young; and Two New Viruses Affecting Pea, and Varietal Reaction of Peas to *Septoria pisi*, both by W. J. Zaumeyer.

[Plant disease papers from Puerto Rico] (*Jour. Agr. Univ. Puerto Rico* [*Col. Sta.*], *22* (*1938*), *No. 3*, *pp. 263–447*, *pls. 2*).—This number is devoted to plant disease papers as follows: Third Supplement to Partial Bibliography of Virus Diseases of Plants, by J. I. Otero and M. T. Cook (pp. 263–409), which like the others in the series (E. S. R., 76, p. 486), is provided with author and subject indexes; and Second Supplement to Host Index of Virus Diseases of Plants (pp. 411–435) which follows the procedure used in the original host index and the first supplement (E. S. R., 76, p. 486), Second Supplement to the Index of Vectors of Virus Diseases of Plants (pp. 437–439) (E. S. R., 76, p. 486), The Witches' Broom of *Tabebuia pallida* in Puerto Rico (pp. 441, 442), and Cucumber Mosaic in Puerto Rico (pp. 443–447), all by Cook.

Studies in the physiology of plant pathogenic bacteria: The food requirements of a xylem invader, Bacterium solanacearum E. F. S., and of a phloem invader, Aplanobacter michiganense E. F. S., R. Mushin (*Austral. Jour. Expt. Biol. and Med. Sci., 16 (1938), No. 4, pp. 323–329*).—In the tests reported the Victorian strain of *B.* (=*Phytomonas*) *solanacearum* under study utilized asparagine, tyrosine, peptone, and glutamic acid as both carbon and nitrogen sources; glucose, sucrose, glycerol, and sodium citrate as carbon sources; and ammonia salts and nitrates as nitrogen sources. Of all the compounds supplied, *A. michiganense* (=*P. michiganensis*) utilized only peptone. An attempt is made to correlate the food requirements of this organism with solutes present in the vascular tissues. Certain variations from type were found in the morphology, cultural characters, and virulence of the strains of these organisms here studied.

Growth of Phymatotrichum omnivorum in solutions with varying amounts of certain mineral elements, C. H. Rogers. (Tex. Expt. Sta.). (*Amer. Jour. Bot., 25 (1938), No. 8, pp. 621–624*).—*P. omnivorum* was grown in flask culture solutions containing Al, B, Cu, Fe, Mn, Hg, and Zn in concentrations of 0.2–500 p. p. m. and the dry weights were obtained after growth periods of 15–30 days. Cu as $CuSO_4$ proved highly toxic, no growth being obtained above 25 p. p. m. Growth was inhibited in a nonstarchy medium containing as little as 1 p. p. m. of Cu. During the shorter growing periods there was no growth above 10 p. p. m. of this element. Hg as $HgCl_2$ was second to Cu in toxicity, but the fungus was much more tolerant of it than of Cu. Zn in all concentrations up to and including 200 p. p. m. gave some stimulation to growth, and Fe and Cu were also stimulative at certain concentrations. At the end of 30 days cultures containing Mn at all concentrations used (1–500 p. p. m.) showed more growth than the controls. High concentrations of Mn caused a breaking up of the mycelial mats to form colonies of a compact nature. About 10 times as much growth was obtained in starchy as in nonstarchy media.

Germination experiments with over-wintered teliospores of Tranzschelia pruni-spinosae, J. C. Dunegan. (U. S. D. A. and Ark. Expt. Sta.). (*Phytopathology, 29 (1939), No. 1, pp. 72–78, fig. 1*).—In germination tests with overwintered teliospores of the *discolor* and *typica* varieties of *T. pruni-spinosae* performed at various times (1924–38), those of the *discolor* variety failed to germinate in any of the tests, but those of the *typica* variety overwintered on fallen leaves of *Prunus serotina* germinated at various times from February 11 to April 6, 1938. Germination and basidiospore formation were more profuse when the teliospores were scattered over the surface of water agar in Petri dishes than when they were suspended in hanging drops of tap water. Only one promycelium was produced from each cell of the teliospore though both cells frequently germinated. The basidia are formed from the apical portion of the promycelia and produce hyaline, smooth-walled basidiospores 12.5μ–16μ by 5.5μ–6.5μ. The results suggest that basidiospore production occurs outdoors under natural conditions during a period of several months in the spring.

Smuts of cereal and forage crops in Kansas and their control, L. E. Melchers (*Kansas Sta. Bul. 279 (1938), pp. 37, figs. 17*).—This is a general hand book dealing with the losses involved, the three groups of smut fungi and the characteristics of the smut diseases induced by them, the effects of infected cereals and forage crops on livestock, and seed treatments to prevent smuts—the most common of which are the chemical dust, formaldehyde, and modified hot-water treatments. Detailed procedures for the different hosts and types of smut are outlined.

A seed-borne disease of vetch and peas, W. Crosier (*Farm Res.* [*New York State Sta.*], *5 (1939), No. 1, p. 14*).—The danger from seed-borne vetch diseases is stressed particularly from the angle of infections to the closely related common pea, and the leaf- and pod-spotting fungus affecting both peas and the wild and commercial vetches is given as an example. This disease is perpetuated on wild vetches, and infected seed stocks of commercial vetches were found always to be very common. Disinfection methods have proved of little value, but disease-free stocks may be obtained by selection from nonspotted pods or—there is every reason to believe—by seed production in certain western irrigated regions.

Reaction of wheat, barley, and rye varieties to stripe rust in the Pacific Northwest, W. M. Bever. (Coop. Idaho Expt. Sta.). (*U. S. Dept. Agr. Circ. 501 (1938), pp. 15*).—Field and greenhouse studies of their reactions to *Puccinia glumarum* were made on 317 wheat varieties grown in the United States and 1,284 foreign introductions (including common, club, durum, emmer, poulard, and Polish wheats), 365 barley varieties, and 11 rye varieties. The greenhouse tests were limited to seedling reactions, while in the field the rust readings were made at the soft-dough stage. The inoculum for the greenhouse tests consisted of physiologic race 19, while in the field infection was from natural sources.

Of the commercial winter wheat varieties, Blackhull, Cheyenne, Kanred, Oro, Ridit, and Turkey (C. I. 6175) of the hard red winter class, and Fulhio, Nittany, and Red Rock of the soft red winter class proved most resistant. The Defiance, Dicklow, and Irwin Dicklow white spring wheats, and the Democrat, Eaton, Hard Federation × Martin, and Rex selection (C. I. 11689) white winter varieties were resistant. As a class the club wheats were most susceptible, Big Club alone showing resistance at both the seedling and soft-dough stages. Of the 14 durum varieties tested, Kubanka, Mindum, and Monad were the only ones susceptible in the field, while Mondak and Nodak were susceptible only in the seedling stage. About half of the 365 barley varieties tested in the greenhouse had an immune type of reaction. Winter Club, Hannchen (C. I. 602), Meloy, Horsford, and Wisconsin Pedigree 38 were resistant. Of the 11 rye varieties tested, 10 were immune or resistant, Prolific Spring being the only one exhibiting any appreciable susceptibility.

Inheritance of resistance to leaf rust in common wheat, W. E. Adams (*Jour. Amer. Soc. Agron., 31 (1939), No. 1, pp. 35–40, figs. 4*).—When Hope wheat, resistant to *Puccinia triticina*, was crossed with the susceptible Leap Prolific, Fulcaster, and Purplestraw varieties the F_1 showed very little infection, apparently due to a small amount of inoculum or unfavorable weather conditions. Resistant, intermediate, and susceptible plants occurred in the F_2, Hope × Leap Prolific showing 81 percent of the plants below 25 percent infection, with the reciprocal cross behaving similarly. Purplestraw × Hope F_2 showed 91 percent of the plants below 25 percent infection. Hope × Fulcaster F_2, with greater resistance than any of the other crosses, gave 70 percent of the plants below 4 percent infection. The F_3 gave rows which were highly resistant, intermediate, and highly susceptible, and F_3 families were obtained in each cross which gave less than 5 percent infection.

A respiratory study of powdery mildew of wheat, P. J. Allen and D. R. Goddard (*Amer. Jour. Bot., 25 (1938), No. 8, pp. 613–621, figs. 6*).—A method is described for distinguishing between the gaseous metabolism of *Erysiphe graminis tritici* and of its host. The respiration of mildewed wheat was very much higher than that of normal wheat. Part of this extra respiration occurs in the attached mildew, but a larger part occurs in the mesophyll cells of the host which are not invaded by nor in contact with the hyphae.

"The respiration of normal wheat is stimulated about 50 percent by 10^{-3} molar hydrogen cyanide, is unaffected by 10^{-3} molar sodium azide, or by carbon monoxide at partial pressures of 90 and 95 percent atmospheric. About 80 to 90 percent of the respiration of mildewed epidermis is inhibited by 10^{-3} molar hydrogen cyanide or sodium azide. The respiration of mildewed wheat is reduced in the presence of 10^{-3} molar sodium azide by an amount of the same order of magnitude as the respiration of mildewed epidermis.

"The respiration of wheat tissues after infection with mildew rises to a maximum 650 percent above normal wheat. This increase follows a logarithmic curve, and the maximum is reached 6 days after inoculation. Beginning on the sixth day after inoculation the respiration of the host is always about 3.4 times as high as that of the mildew, despite a series of rather large fluctuations in the absolute respiratory rate of both. The temperature coefficient of normal wheat increases with increasing temperature between 16° and 30° C., whereas the temperature coefficient of mildewed wheat decreases with increasing temperature between 12.5° and 30° C. No measurable anaerobic CO_2 production occurs in mildewed epidermis. The anaerobic CO_2 production of wheat which has been infected with mildew for 8 days is 50 percent higher than that of normal wheat."

Smutty wheat report No. 23, R. J. Haskell and E. G. Boerner. (*U. S. Dept. Agr., [Bur. Agr. Econ., 1938], pp. [2]+5*).—This summary of smutty wheat receipts at the terminal markets for the crop year beginning July 1937 was prepared from information contained in the monthly reports of Federally licensed grain inspectors in the United States as submitted by the various officers of Federal Grain Supervision to the Grain Division of the Bureau of Agricultural Economics. The tabulations were made by V. Hopkins, under the authors' supervision.

Abnormal mitosis in seedlings of some Gramineae following seed treatment, J. E. Sass. (Iowa State Col.). (*Amer. Jour. Bot., 25 (1938), No. 8, pp. 624–627, figs. 20*).—Ethyl mercury phosphate was found to induce hypertrophy and abnormal mitosis in meristematic cells of seedlings of corn and several small grains. The toxic agent was absorbed by sprouting kernels and by the seedling root tips. The abnormality was produced in axillary bud primordia and other meristematic cells remote from the absorbing region. Nuclear division was characterized by formation of multipolar spindles, irregular or incomplete anaphase separation of split chromosomes, and by failure of plate formation. Irregular multipolar separation produced multinucleate cells. The nuclei of a given cell may be about equal in size and chromosome number or they may be very unequal. Total failure of anaphase separation produced giant, polyploid restitution nuclei. Cell plate formation may be initiated, but such plates are apparently evanescent.

Stagonospora leaf spot and root rot of forage legumes, F. R. Jones and J. L. Weimer. (U. S. D. A. and Wis. and Calif. Expt. Stas.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 11, pp. 791–812, figs. 3*).—This root rot of alfalfa, first found by the authors in California and Wisconsin, is due to a fungus known hitherto chiefly as a leaf-spotting pathogen but having three forms—all described previously as independent species. The fungus is capable also of inducing sweetclover root rot, though this has been observed only once in the field. Macroscopically, it is not easily distinguishable, but it is readily identified by staining (Gram method) the mycelium in roots or large stems but not in leaves or media. The root rot develops slowly and is favored by high temperature, but the leaf spot develops abundantly at low temperatures in early spring and late fall. The chief imperfect stage of the fungus is here defined as a morphological species of *Stagonospora* identifiable on its hosts in three legume genera by the rostrum of the pycnidium. Cultures have been made from most of the known hosts, and while variable therein none of the variations seem to be associated with the host origin. Some of the isolates from the more important hosts infected sweetclover in varying degree, as did those from this host itself. The first and most conspicuous fruiting form of the fungus appears to be properly designated *S. meliloti*, though there are a large number of synonyms, which are discussed. The second form, as yet found only on *Melilotus alba* in the fall, has been previously described as *Phoma meliloti*, while the ascigerous form, thus far found on alfalfa and sweetclover stems in the spring, is *Leptosphaeria pratensis*. For a closely related species of *Stagonospora* on *Trifolium pratense* the name *S. recedens* n. comb. is proposed.

The degeneration of Metropolitan bent, A. R. GEMMELL (*Phytopathology, 29 (1939), No. 1, pp. 95–102, figs. 4*).—The symptoms of a new disease of the Metropolitan bent variety of *Agrostis stolonifera* are death of the plants over large areas of the green, with death of the leaf beginning at the tip. Typical of the disease is the escape of a few plants of a lighter green in the diseased areas. The disease was not controlled by mercurials, aeration, or alteration of the water schedule. The susceptible variety was characterized by very dense turf formation and extremely short roots, while the escaping plants and resistant varieties had much longer roots. From analysis of the evidence the disease is believed to be due to a deficiency of one of the minor elements necessary to growth.

Scolecospores in Diplodia zeae, H. JOHANN. (U. S. D. A. and Wis. Expt. Sta.). (*Phytopathology, 29 (1939), No. 1, pp. 67–71, figs. 3*).—Scolecospores, hitherto unreported in *D. zeae*, appeared recently in a culture obtained (1934) from a rotted corn kernel from Ohio. These spores (described) are borne in fruiting bodies very similar to the usual pycnidia. The brown bicellular pycnospores and the hyaline scolecospores occur in the same pycnidium and in separate fruiting bodies.

A microchemical study of the effects of boron deficiency in cotton seedlings, C. H. WADLEIGH and J. W. SHIVE. (N. J. Expt. Stas.). (*Soil Sci., 47 (1939), No. 1, pp. 33–36*).—"The development of boron deficiency symptoms in cotton seedlings was followed microchemically. As the symptoms increased in severity, scattered cells throughout the tissues of the stem tips were observed to become much more acid than the normal cells of these tissues. Ammonium nitrogen was observed to accumulate, especially in the more acid cells, although no ammonium nitrogen was supplied to these plants. Sugars were found to accumulate. Protein tests indicated a progressive degeneracy of the protoplasm. It is suggested that in the absence of boron the normal course of protein synthesis is altered."

Berberine as a factor in the resistance of Mahonia trifoliolata and M. swaseyi to Phymatotrichum root rot, G. A. GREATHOUSE and G. M. WATKINS. (U. S. D. A. and Tex. Expt. Sta.). (*Amer. Jour. Bot., 25 (1938), No. 10, pp.*

743–748, figs. 10).—The alkaloid berberine was shown to be present (dry weight basis) in the roots of *M. trifoliolata* in concentrations of 1.33–2.25 percent, and in roots of *M. swascyi* of 2.15–2.48 percent. The lowest concentration above noted is said to be more than 65 times that shown experimentally to prevent the growth of *P. omnivorum*. In the above-ground parts of the plant the berberine concentration was lower, ranging from 0.45 percent in older stems to none in young leaves. Study of fresh-root sections of these plants, treated microchemically to crystalline berberine in situ, revealed it to occur widely in the walls of tracheids and vessels in the xylem and in smaller amounts in the lumina of cells of the wood rays. In extra-cambial tissues it occurred in a more or less continuous zone surrounding the active phloem. The bast fibers were impregnated with berberine, and small amounts were frequently noted in the periderm. The generally continuous zone of berberine-containing parenchymatous cells surrounding the root just beneath the periderm is considered to have special significance as a possible factor in the resistance of these two plants to *Phymatotrichum* root rot.

The growth of actinomycetes on different varieties of potatoes, W. W. Umbreit. (N. J. Expt. Stas.). (*Amer. Potato Jour., 15 (1938), No. 12, pp. 349–355, figs. 2*).—Seven distinct strains of *Actinomyces scabies*, the potato scab organism, and at least one species each of the other major groups of actinomycetes and proactinomycetes were grown at 28° C on autoclaved plugs of tuber tissue of 14 varieties of potatoes differing in known susceptibility to scab. Comparson of the extent of growth after 1 week and again after 3 weeks gave no evidence whatever of any correlation between the growth of any strain on the potato tissue and the potato variety used or between the growth of any of the strains of fungi on tuber tissue from different varieties and the relative susceptibility of the latter to scab in the field. Pressure-sterilized potato plugs inoculated with the scab organism appear, therefore, of no value in testing for varietal resistance to scab.

A study of viruses infecting European and American varieties of the potato, Solanum tuberosum, T. P. Dykstra (*Phytopathology, 29 (1939), No. 1, pp. 40–67, figs. 7*).—The chief symptoms on American and European potato varieties and certain other Solanaceae are described for mild mosaic, crinkle mosaic, crinkle, leaf-rolling mosaic, and para crinkle, and the veinbanding, Y, stipple streak, X, top-necrosis B, and top-necrosis C viruses. Mild mosaic, crinkle mosaic, and crinkle, although not identical, proved to be so similar that the virus, in addition to X in the complex causing each of the three diseases, is designated as virus A. Leaf-rolling mosaic is distinct from para crinkle. Veinbanding, Y, and stipple streak viruses are closely related strains of the same virus, and all three are included under virus Y. No relationship was found between the veinbanding and cucumber mosaic viruses. *Amaranthus retroflexus* proved to be a host of virus X. Virus B produces top necrosis in the varieties Arran Victory and President. Green Mountain was found to be normally a symptomless carrier of this virus in addition to virus X. Virus C causes top necrosis, as a current-season symptom, in all of the American potato varieties tested.

Properties of the potato yellow-dwarf virus, L. M. Black (*Phytopathology, 28 (1938), No. 12, pp. 863–874, figs. 2*).—This virus, carried by the clover leafhopper, *Aceratagallia sanguinolenta*, is difficult to transmit mechanically in potatoes or clover, two of its important hosts. The pin puncture method of inoculating these hosts proved superior to the carborundum method but gave, at best, only 50 percent infection. The yellow-dwarf virus was separated from the X-virus by inoculation of *Nicotiana glutinosa* with infective leafhoppers taken from clover. Among the 13 new hosts reported, the virus in one of them (*N. rustica*) produced numerous primary lesions on leaves inoculated by the carborundum method. Through this primary-lesion reaction it was determined that the virus is inactivated at room temperature in 2.5–12 hr., and is destroyed at 50° C. in 10 min. It was nonviable in dried leaves, had a dilution end point of 10^{-3} to 10^{-5}, and passed through a Berkefeld W filter.

Blue mold (downy mildew) of tobacco and its control. (Coop. N. C. Expt. Sta. et al.). (*Virginia Sta. Bul. 318 (1938), pp. 18, figs. 8; also South Carolina Sta. Circ. 58 (1938), pp. 18, figs. 8*).—This is a general compendium of information on tobacco downy mildew, considering the name, host plants, history of the disease, losses due to it, symptoms, the fungus incitant and its life history, factors affecting development of the disease, plant-bed preparation, and control treatments (benzol and paradichlorobenzol fumigation, spray treatments, and the various procedures and apparatus involved).

Downy mildew (blue mold) of tobacco, R. R. Kincaid and W. B. Tisdale (*Florida Sta. Bul. 330 (1939), pp. 28, figs. 12*).—This constitutes a general digest of information on tobacco downy mildew, covering essentially the same ground as the preceding entry, with applications to Florida conditions.

Downy mildew infection of flue-cured tobacco in the field, J. A. Pinckard and L. Shaw. (Va. and N. C. Expt. Stas.). (*Phytopathology, 29 (1939), No. 1, pp. 79–83, figs. 4*).—The symptoms on field-grown plants are described as being small necrotic spots, usually grouped and giving a blotched effect, or chlorotic areas with indefinite margins which may later necrose and fall from the leaf. Meteorological conditions attending the field epidemic are given. Sources of inoculum for field infection are thought to arise from seed beds infected with *Peronospora tabacina*.

An estimate of the maximum value for the molecular weight of the tobacco mosaic virus protein, V. L. Frampton and A. M. Saum. (Cornell Univ.). (*Science, 89 (1939), No. 2300, pp. 84, 85, figs. 2*).—On the basis of the observations and discussion presented relative to ultracentrifuge, diffusion, and viscosity studies, the authors conclude that probably less ambiguous values for the particle weight may be obtained from the data for the diffusion in urea solutions. Recalling that a molecule is the smallest particle existing as an independent entity, they ask, "would one not reason that a maximum value for the molecular weight that may be assigned to the virus protein is of the order of 10^5?"

The viscosity of tobacco mosaic virus protein solutions, M. A. Lauffer (*Jour. Biol. Chem., 126 (1938), No. 2, pp. 443–453, fig. 1*).—From measurements of the specific viscosity of the virus protein solutions in conjunction with sedimentation data, the size and shape of the tobacco mosaic virus protein molecule was estimated, two alternate sets of values being obtained—(1) molecular weight 42.6×10^6, diameter 12.3 mμ, and length 430 mμ, and (2) molecular weight 63.2×10^6, diameter 11.5 mμ, and length 725 mμ. Both sets of values are of the same order of magnitude as those obtained from stream double refraction, diffusion, ultrafiltration, and X-ray diffraction data. In terms of an arbitrarily chosen model with dimensions of the first set of values, it was shown that a second component, with particles formed by the end-to-end association of two rodlike molecules resembling the model, should have a sedimentation constant of 202×10^{-13} as compared with 174×10^{-13} for the original component. Preparations of tobacco mosaic virus protein with double boundaries in the ultracentrifuge have components with sedimentation constants of 174×10^{-13} and 200×10^{-13}. Variations in viscosity and double refraction of flow of the protein with changes in pH are discussed. Both these characteristics increased in the region of the isoelectric point, but only the viscosity fell sharply to a minimum very near that point. This behavior is regarded as due to the end-to-end association of rodlike molecules, followed by the side-to-side association of the long rods as one approaches the isoelectric point from either side. The viscosity was found to decrease on addition of electrolytes, probably due to the electrokinetic potential of the particles.

Properties of the latent mosaic virus protein, H. S. Loring (*Jour. Biol. Chem., 126 (1938), No. 2, pp. 455–478, figs. 2*).—Using both *Nicotiana glutinosa* and Turkish tobacco plants as virus sources, the yields and relative or specific activity of the latent-mosaic or X virus prepared by chemical treatment and ultracentrifugation at low temperatures were determined. The results indicate that purified viruses varied widely in relative activity, depending on the method of purification, but they had the same qualitative solubility and serological properties, about the same ability to pass ultrafilters of ±450 mμ average pore diameter when dissolved in nutrient broth and 0.1 M phosphate at pH 8.5, and, like the highly active virus, they formed liquid crystalline solutions. They differed from the more active preparations in forming more opalescent solutions and in giving highly diffuse boundaries in the ultracentrifuge. Analyses of the ultracentrifuge-purified virus showed it to be a nucleoprotein containing ±6 percent nucleic acid, and a pentose nucleic acid was also shown to be present. The carbohydrate: phosphorus ratio was about twice that found by the same method for yeast nucleic acid, and besides carbohydrate combined as nucleic acid other carbohydrate may therefore be present. The latent mosaic virus was relatively unstable below pH 4, but stable at pH 7.5–9. The relatively high homogeneity of the ultracentrifuge-purified virus, and the ability to pass ultrafilters of ±250 mμ average pore diameter indicate that such virus, as contrasted to that prepared by $(NH_4)_2SO_4$ treatment, is essentially the same as that in infectious juice.

Optical properties of solutions of tobacco mosaic virus protein, M. A. Lauffer (*Jour. Phys. Chem., 42 (1938), No. 7, pp. 935–944, figs. 6*).—It is shown that when dissolved in liquids with a refractive index approaching that of the protein itself, little or no stream double refraction is obtained with tobacco mosaic virus protein. Ultracentrifuged jellylike pellets of the protein had properties charactersitic of the liquid crystalline or paracrystalline state. Relatively concentrated solutions of the protein separated into two layers on standing, and this study indicated that in the top layer the scattered light is depolarized to a small extent, while in the lower one it is very largely depolarized. All the results are considered consistent with the conclusion that the protein particles or molecules are rod-shaped nucleoproteins with little or no intrinsic double refraction. In this property the virus protein is said to differ distinctly from the sperm cells of cuttlefish and cells of other living organisms having the property of double refraction or paracrystallinity.

The partial reactivation of formolized tobacco mosaic virus protein, A. F. Ross and W. M. Stanley (*Jour. Gen. Physiol., 22 (1938), No. 2, pp. 165–191, figs. 5*).—A marked reactivation of formaldehyde-inactivated virus protein was obtained by dialysis at pH 3, the activity of partially inactivated proteins generally being increased about tenfold by the process. The inactivation and subsequent reactivation could not be explained by the toxicity of the formaldehyde or of the formolized protein or by aggregation. Inactivation was accompanied by a decrease in amino groups, and it caused a decrease in the number of groups reacting with Folin's reagent at pH 7.7—the latter probably the indole nuclei of tryptophane. Evidence that reactivation is accompanied by an increase in amino nitrogen and in groups reacting with Folin's reagent was obtained by colorimetric estimation.

"The demonstration that the addition of formaldehyde to the virus protein results in a simultaneous decrease of activity, of amino groups, and of groups that react with Folin's phenol reagent, and that under conditions favorable for the removal of formaldehyde the virus activity is regained and the number of such groups increases, indicates that certain of these groups play at least a partial role in the structure necessary for virus activity. These changes can best be interpreted on the basis of known chemical reactions and are considered as evidence that virus activity is a specific property of the protein."

Studies on the virus of tobacco necrosis, W. C. PRICE (*Amer. Jour. Bot.*, *25* (*1938*), *No. 8*, *pp. 603–612*, *figs. 4*).—Symptoms of this necrosis developed in inoculated Turkish tobacco leaves within 18 hr., a shorter time than for any other plant virus known. Some of the properties of the virus are described. The Black variety of cowpea proved to be a good host for measuring its concentration. When the logarithms of the numbers of lesions produced in this host were plotted against those of the dilution virus used for inoculation, the points were found to lie along a straight line with a slope of ±0.7. No evidence of spontaneous transmission of this virus or of its occurrence in nature has yet been found, nor could it be demonstrated that plants are infected by entrance of the virus through stomata. It does not usually move from inoculated leaves into other parts of the plant. However, infection by pouring the virus over the soil around the roots was confirmed. Tobacco-necrosis virus was not found related to the tobacco mosaic, tobacco ring spot Nos. 1 or 2, cucumber mosaic, or severe-etch virus groups.

Ultracentrifugation of juices from plants affected by tobacco necrosis, W. C. PRICE and R. W. G. WYCKOFF (*Phytopathology*, *29* (*1939*), *No. 1*, *pp. 83–94*, *figs. 2*).—Characteristic macromolecular substances sedimenting with a single sharp boundary and a sedimentation constant of $S_{20}^{\circ}=112 \times 10^{-13}$ cm sec.$^{-1}$ dynes^{-1} were obtained by quantity ultracentrifugation from Turkish tobacco, cucumber, cowpea, and *Nicotiana glutinosa* infected with tobacco-necrosis virus. The amounts were roughly proportional to the infectiousness of the juices of the plants tested. Purified solutions of the material from tobacco plants were considerably more infectious than the original juice when the dilution end points were used for comparison, but only slightly, if at all, more infectious when undiluted solutions were compared. For this reason, and because of the possibility that inhibiting substances might be present in the juices of diseased plants, it could not be definitely concluded that virus activity was concentrated by the ultracentrifugal procedure used, though it seems probable that this was so.

The infectious juices from diseased cucumber and cowpea plants contained lighter components probably the same as the pigmented macromolecular substances present in considerable amounts in healthy plants of the same species. Small amounts of similar noninfectious macromolecular substances were found in healthy Turkish tobacco and *N. glutinosa*. All these substances, except that of cowpea, sedimented with a constant of S_{20}°=ca. 75×10^{-13} cm sec.$^{-1}$ dynes^{-1}. That of cowpea sedimented with $S_{20}^{\circ}=51 \times 10^{-13}$.

Relation of soil temperature and nutrition to the resistance of tobacco to Thielavia basicola, F. L. JEWETT (*Bot. Gaz.*, *100* (*1938*), *No. 2,*, *pp. 276–297*, *figs. 37*).—Tobacco plants (five varieties tested) with or without nitrogen showed no differences in resistance or susceptibility to the fungus at any given temperature, and changes in nutrition failed to change the order of resistance.

The evidence of other investigators was confirmed that soil temperature is the most important environal condition determining the expression of resistance and susceptibility, and the breeding of resistant varieties is the most important practical method of control.

Periderm formation in control plants at different temperatures and with or without nitrogen was not correlated with resistance, and no evidence of its formation in advance of the fungus or around the lesions was found. Response to the wounds made by the fungus resembled that to mechanical wounds, and callus formation in roots and stems in response to injury by the fungus appeared to be regenerative rather than defensive. It is concluded that resistance to *Thielavia* under certain environal conditions is not determined primarily by anatomical modifications in the root or crown of the plant.

Field studies of certain diseases of snap beans in the southeast, W. D. Moore. (Coop. S. C. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 647 (1938), pp. 28, figs. 2*).—Dry root rot (*Fusarium martii phaseoli*) was greater with seeding at 2 in. than at 1–1.5 in. depths, but there was no correlation between infection and yield. The disease tended to decrease with delay in date of spring planting, but over a period of years the amount appearing with the earliest planting dates did not materially affect the total yield. Neither the composition nor the application rate of a complete fertilizer affected the development of dry root rot on snap beans. Fertilizer placement, particularly where the growing roots were in contact with concentrated chemicals, influenced its development significantly, but the amount of disease did not materially influence the yields. Significant differences in susceptibility to both dry root rot and mosaic appeared among snap bean varieties, but the yield differences were apparently due rather to regional adaptations and varietal characteristics than reactions to these diseases. Seed treatment with ethyl mercury tartrate improved the stands during cool rainy seasons but did not correspondingly increase the yields, due probably to plant competition. In mosaicked plants the pods were shorter, lighter in weight, and significantly fewer in number than in healthy plants.

Internal black spot of canning beets and its control, J. C. Walker, J. P. Jolivette, and J. G. McLean. (Univ. Wis.). (*Canning Age, 19 (1938), No. 13, pp. 489–491, 508, figs. 3*).—The results of the tests reported (1938) are believed sufficient to indicate that internal black spot may be readily corrected by borax applications, and that this may be broadcast or applied in bands near the row along with the fertilizer. The method used in any given case might well be determined by the available machinery and customary practices. For Wisconsin conditions about 40 lb. per acre is suggested as a reasonable rate, and rates up to 60 lb. did not prove injurious. When row applications are made the material should be placed an inch or more removed from the seed.

Western celery mosaic, H. H. P. Severin and J. H. Freitag (*Hilgardia [California Sta.], 11 (1938), No. 9, pp. 493–558, pls. 8, figs. 9*).—Celery calico, yellow spot, crinkle-leaf, yellows, spotted wilt, and western celery mosaic are said to occur on celery under natural conditions in California, while it has been artificially infected with the sugar-beet curly top and poison hemlock ringspot viruses. Spontaneous infection with western celery mosaic virus has been demonstrated in celeriac and in varieties of celery and carrots, while various other economic plants of the Umbelliferae have been successfully inoculated. Mechanical inoculations of celery with juice from the leaves of mosaicked carrots resulted in less infection than with that from the roots. The virus was more readily recovered from symptomless carriers of Single or Plain parsley by mechanical inoculation than by *Aphis ferruginea-striata.*

Mechanical inoculation of cucumber with the extract from mosaicked celery from 23 California localities and attempts to transmit the virus by 11 aphid species from spontaneously infected celery were failures. The virus of this western celery mosaic passed through all grades of Chamberland filters. Thermal inactivation was obtained by 10-min. exposure to 60° C. A temperature of —18° for 18 mo. failed to inactivate the juice extracted from spontaneously infected celery. The toleration to dilution was 1:4,000. A 7-day exposure to the air at room temperature inactivated the virus in extracted juice. Virus in the supernatant liquid withstood treatment with 30 percent alcohol and in the precipitate with 40 percent alcohol for 1 hr. Six aphid species not found naturally breeding on celery were shown to be capable of transmitting the virus, as well as 11 species normally breeding thereon. Tests with the various species and under differing conditions are reported in detail. The retention of the virus by single wingless aphids varied from 1 to 8 hr. and by lots of 20 infective aphids from 1 to 10 hr. In some cases aphids recovered the virus from celery before symptoms of the disease developed, in others on the same day after the earliest symptoms appeared, and in still other cases 1–6 days after the first disease symptoms were noted. There is no specific vector of western celery mosaic virus. A bibliography of 40 references is included.

Control of tomato diseases in the seed bed and cold frame, A. L. Harrison, P. A. Young, and G. E Altstatt (*Texas Sta. Circ. 82 (1939), pp. 14, figs. 4*).—This paper presents briefly some practices that have proved of value in producing healthy, vigorous tomato plants for setting in the field. The principal diseases of seed bed and cold frame to be combated are said to be preemergence and postemergence damping-off, collar rot, mosaic, bacterial spot, bacterial canker, stem canker, leaf spot, leaf blight, and root knot.

Delayed spraying of tomatoes is proved to be feasible, J. G. Horsfall and J. W. Heuberger (*Farm Res. [New York State Sta.], 5 (1939), No. 1, p. 16, fig. 1*).—This is a preliminary report of a 9-yr. study of tomato spraying problems through which it was indicated that this plant is especially sensitive to alkaline sprays such as bordeaux. The simplest solution would be to use a neutral or lime-free copper spray, and tests with red copper oxide appear to indicate its dependability. Furthermore, the 1938 tests showed that spraying can be delayed apparently until the first leaf dies from blight. This means that no spraying need be done in blight-free years, with a corresponding saving in costs and in danger from spray injury to the more susceptible young foliage.

A new attack on tomato blight, J. G. Horsfall. (N. Y. State Expt. Sta.). (*Canner, 88 (1939), No. 5, pp. 24, 25, 60, figs. 3*).—Essentially noted above.

Aucuba mosaic virus protein isolated from diseased, excised tomato roots grown in vitro, W. M. Stanley (*Jour. Biol. Chem., 126 (1938), No. 1, pp. 125-131*).- The properties of this macromolecular protein isolated by differential centrifugation from excised roots in vitro proved to be essentially the same as those of aucuba mosaic virus protein isolated from diseased tomato plants grown under normal conditions in the greenhouse. The concentration reached by the protein in excised roots in vitro was slightly less than that in the roots and less than 20 percent that in the leaf tissue of greenhouse plants.

Leaf growth as affected by spray materials, W. D. Mills (*Maine State Pomol. Soc. Ann. Rpt., 1936–38, pp. 38–43, figs. 3*).—In the tests reported, substituting wettable sulfur for lime-sulfur in the summer sprays for 5 yr. increased the yields 1.5 bu. total fruit per tree per year over the continued straight lime-sulfur schedule, while the wettable sulfur schedule for all sprays showed an additional increase over lime-sulfur of 4 bu. over the preceding averages for the same trees. In this orchard it meant increases per acre per year of 59 and 140 bu., respectively, the increases being due to larger bearing surfaces and better pollination. In spite of its greater tendency to spray injury and to reduction in yield, the superior effectiveness of lime-sulfur against scab makes its use imperative in certain situations.

New results with spray materials and methods for control of the more serious apple and peach diseases, J. W. ROBERTS. (U. S. D. A.). (*Md. Agr. Soc., Farm Bur. Fed., Rpt., 22 (1937), pp. 143–146*).—This is a general discussion based particularly on work of the past 6 yr., directed especially toward the development of copper fungicides for replacing lime-sulfur, elemental sulfur, and bordeaux mixture for the spring and early summer applications on apples. In general, the noninjurious "insoluble" copper sprays, at the present stage of development, are not sufficiently effective against scab for use in all applications, while those of higher solubility are apt to cause injury. All the copper sprays are considered as probably injurious to peaches. Lime-sulfur is said to be still the standard spray for scab on susceptible apple varieties, while zinc-lime is widely used to prevent arsenical injury and bacterial spot on peaches and as a remedy for various nonparasitic diseases of fruit trees and other plants. Spreaders and stickers, and other details regarding disease control for apples and peaches, are discussed.

Fungicides and injuries to fruits and foliage, A. B. GROVES. (Va. Expt. Sta.). (*Va. Fruit, 27 (1939), No. 1, pp. 122, 123*).—Based on 1938 tests (confirmatory of the past 5 years' results) the apple foliage has been best where some copper material has been used in the cover sprays—due almost entirely to its corrective action on the lead arsenate. Experience is said to indicate the advantageous use of a sulfur fungicide through the first cover spray in most seasons, followed by some copper cover material where the variety will tolerate it. The final cover or covers should be of a weak bordeaux or some safe proprietary copper where an arsenical is used, but no satisfactory fungicide is said to be available for use with fixed nicotine.

Peach fungicides, R. H. HURT. (Va. Expt. Sta.). (*Va. Fruit, 27 (1939), No. 1, pp. 137–139*).—This is a general discussion of fungicides for peaches, with preliminary trials (one season) giving some promise that if arsenical injury is prevented by the proper amount of zinc-lime a sufficient strength of bordeaux mixture for control of scab and brown rot may safely be used.

A cytological study of resistance of Viking currant to infection by Cronartium ribicola, O. C. ANDERSON (*Phytopathology, 29 (1939), No. 1, pp. 26–40, figs. 2*).—The leaves of this highly resistant Norwegian Red Dutch currant, of unknown origin but probably in part derived from *Ribes petraeum*, were compared with those of the three susceptible species *R. nigrum*, *R. sativum* (hybrid variety, American Red Dutch), and *Grossularia hirtella*, all of which had been similarly inoculated during 2 yr. with *C. ribicola*. Cytological studies indicated that infection occurs through the stomata in young unhardened Viking leaves, but the resulting sparse hyphae die before the fungus develops or produces spores. The brief presence of hyphae in the immature leaf tissue causes necrotic flecks subsequent to the death and disappearance of the rust mycelia. Mature, hardened leaves usually failed to show these evidences of infection, although germ tubes penetrated the leaves via the stomata. The fungus entered the stomata of the three susceptibles similarly, but abundant development with production of fruiting bodies followed. Resistance is believed to be physiological rather than physical, since the leaves did not differ appreciably in gross anatomy from the three susceptibles in which fertile uredinia readily formed. These new findings substantiate the results of extensive inoculation and field tests in which the Viking currant was demonstrated to be extremely resistant and prohibitive to the development of the fungus spores.

Further investigations of brown-staining fungi associated with engraver beetles (Scolytus) in white fir, E. WRIGHT. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 10, pp. 759–773, figs. 6*).—Continuing his studies (E. S. R., 73, p. 636) of the brown discolorations frequently observed as regularly associated with the galleries of three species of scolytid beetles commonly infesting *Abies concolor*, the author reports that isolations from the stained bark and adjacent sapwood indicate a causal relation of two fungi, and that isolations from newly emerged beetles suggest a definite specificity. The fungus most commonly associated with *S. praeceps* and *S. subscaber* was identified as *Spicaria anomala*, while *Trichosporium symbioticum* causes a darker discoloration and has been previously shown to be constantly associated with *Scolytus ventralis*. Inoculations have proved that both fungi induce pathogenic stains and kill the cambium as they advance, and in this way they may aid the beetles in overcoming infested trees. *Spicaria anomala* was found to reduce the moisture content of the stained wood more than the other fungus, though the latter caused an average reduction to three-fifths that of unstained wood. It appears probable that the respective fungi occur in definite regions of the tree because they are introduced into the egg galleries by the different scolytid beetles. On the basis of the evidence obtained it is believed that the association of the brown-staining fungi with the respective beetle species may well be of definite aid in the successful establishment and maintenance of individual beetle broods.

Brown-stain in sugar maple: Its effect on the physical and mechanical properties of the wood, W. E. WAKEFIELD (*Canada Dept. Mines and Resources, Lands, Parks, and Forests Branch, Forest Serv. Circ. 53 (1938), pp. 7, figs. 3*).—The results of this study indicated that there is no weak plane at the junction of "brown-heart" and "white" maple, and resistance to shear in this area was as high as that in the test specimens composed wholly of brown-heart or white wood, whether the material tested was in the green, air-dried, or kiln-dried condition. There was no clearly defined difference in strength of the brown-heart v. white wood specimens as tested for shear, cleavage, or tension. The density of brown heart in the green condition was lower than that of the average of normal maple taken from several diverse localities, but in the air-dry condition the difference was negligible. The presence of brown heart in wood for last-blocks is said not to be a serious defect, provided the necessary care is taken during seasoning to insure that stresses in the material are correctly relieved and that the moisture distribution is uniform.

White pine blister rust control—Michigan, 1937 (*[Lansing]: Mich. Dept. Agr., [1938], pp. [4]+49*).—"The problem within the State is to give protection to the balance of the white pine acreage by 1948." To accomplish this end the control program includes initial and recheck cultivated black currant elimination, wild *Ribes* eradication with first, second, and third workings, keeping the white pine nurseries free of *Ribes*, assisting in reforestation, and a general program of educaton. This mimeographed report gives the detailed progress, including costs and statistics.

Proceedings of the Root-knot Nematode Conference held at Atlanta, Georgia, February 4, 1938, edited by J. TYLER (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1938, Sup. 109, pp. 133–151*).—These proceedings list those attending the conference; summarize the discussions on chemical and heat treatments, biological control of root knot, cultural and sanitary practices, and resistance to nematode infestation; and present a paper on Varietal Differences in Resistance to Root-knot in Economic Plants, by K. C. Barrons (Ala. Expt. Sta.), including an annotated list of plants reported (with 30 literature references) as exhibiting such resistance.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Report of the Chief of the Bureau of Biological Survey, 1938, I. N. Gabrielson (*U. S. Dept. Agr., Bur. Biol. Survey Rpt., 1938, pp. 68*).—The work of the year dealt with (E. S. R, 78, p. 656) includes research on wildlife status and management, namely, the waterfowl situation, banding game and other birds, records of bird distribution, studies of wildlife in relation to forests and ranges, biological investigations on wildlife refuges, and State biological surveys and faunal reports; economic research on wildlife, including waterfowl food, mosquito control in wildlife habitat, laboratory research in food habits, cooperative food habits, field investigations of game birds, and field studies of injurious nongame species; research in fur-animal conservation and utilization; wildlife disease control, including fur-animal diseases, duck-sickness (*Clostridium botulinum*), and maladies of propagated game birds; restoration of wildlife habitat by the refuge program; cooperative control of injurious animals; control methods research; wildlife conservation in Alaska; and miscellaneous administrative data.

Field and laboratory technic in wildlife management, H. M. Wight (*Ann Arbor: Univ. Mich. Press, 1939, pp. VIII+107, figs. 34*).—Methods of obtaining scientific information in the field of wildlife management, with particular reference to game birds and game mammals, are considered in this manual. A list of references to the literature accompanies each of the 10 chapters.

Wildlife Review, [November and December 1938] (*U. S. Dept. Agr., Bur. Biol. Survey, Wildlife Rev. Nos. 16 (1938), pp. 38; 17, pp. 41*).—A continuation of this series (E. S. R., 80, p. 69).

Controlling rats and house mice, D. W. Hayne and C. H. Jefferson (*Michigan Sta. Circ. 167 (1939), pp. 32, figs. 16*).—This supersedes Circular 138 (E. S. R., 66, p. 153).

Australian parrots: Their habits in the field and aviary, N. W. Cayley (*Sydney and London: Angus & Robertson, 1938, pp. XXVIII+332, pls. [28], figs. [41]*).—A comprehensive manual.

A modified stain and procedure for trematodes, W. C. Gower (*Stain Technol., 14 (1939), No. 1, pp. 31, 32*).

Some phases of entomological writing from the viewpoint of the reader, R. C. Smith. (Kans. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 5, pp. 563–565*).—A discussion of effective presentation methods.

Advances in entomology during 1938, E. N. Woodbury. (Ohio State Univ.). (*Indus. and Engin. Chem., News Ed., 17 (1939), No. 1, pp. 13–16, figs. 4*).—This review is accompanied by a list of 48 references to the literature.

Some applications of mathematics to an insect life-history study, N. Allen. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 719–722, figs. 2*).—Some of the results obtained in studying the life history of the turnip aphid, one of the more important insect pests of cruciferous crops and widely distributed over the United States and southern Canada, are reported.

Factors influencing insect abundance, J. T. Creighton. (Univ. Fla.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 735–739*).—Feeding experiments have indicated that diet deficiency affects the general vitality of insects and the prolificacy of the females. Tests made by the author indicate that elemental deficiency or variation may likewise materially affect the prolificacy of females. The so-called trace elements were given particular attention.

Tests indicate the possibility of a long-range effect of elemental absorption upon insect populations. This absorption may be directly through the leaf surface or by way of the root system. Indications are that in many cases insect population increase following fungicidal applications may be due more to a physiological change in cell sap than to a destruction of beneficial fungi.

[Notes on economic insects and their control] (*Jour. Econ. Ent.*, *31* (*1938*), *No. 6, pp. 777–782, figs. 5*).—The notes presented (E. S. R., 80, p. 366) are as follows: Further Notes on Cyanide Fumigation of Mushroom Houses, by A. C. Davis (pp. 777, 778), and Resistance of *Stomoxys calcitrans* (L.) to Laboratory Application of Pyrethrum Spray, by C. Eagleson (p. 778), (both U. S. D. A.); Gulf Coast Marsh Ditches That Remain in Good Condition Without Maintenance, by C. Lyle and H. Gladney (pp. 778, 779) (Miss. State Col. et al.); Spontaneous Heating of Insect Baits, by M. D. Farrar and R. H. Reed (p. 779) (Univ. Ill. et al.); Flight of *Alabama argillacea* (Hbn.), by C. N. Ainslie (p. 779); Egg Predator [*Collops quadrimaculatus* F.] of the Chinch Bug, by R. G. Dahms and M. Kagan (pp. 779, 780) (Okla. Expt. Sta.); Some New and Little Known Aphididae of California, by E. O. Essig (pp. 780, 781) (Univ. Calif.); A Method of Rearing the Bedbug (*Cimex lectularius* L.,) for Studies in Toxicology and Medical Entomology, by R. C. Rendtorff (p. 781) (Ill. et al.); and Dinitro-*o*-cyclohexylphenol in the Control of the Citrus Red Mite, by A. M. Boyce (pp. 781, 782) (Calif. Citrus).

Entomological progress, assembled by C. O. Eddy. (Partly coop. U. S. D. A.). (*Louisiana Sta. Bul. 298* (*1938*), *pp. 32*).—The contributions here presented are: Studies on the Control of Cabbage Worms, by C. E. Smith (pp. 3, 4); Early Spring Cutting Assists in the Control of the Three-Cornered Alfalfa Hopper (*Stictocephala festina* (Say)), by L. T. Graham and L. O. Ellisor (pp. 4, 5); Cane Trash Disposal as a Means of Cane Borer Control, by B. A. Osterberger (pp. 5, 6); Control of the Turnip Aphid, by P. K. Harrison (pp. 7, 8); Control of the Velvet Bean Caterpillar (*Anticarsia gemmatilis* Hbn.) in Seed Production, by L. O. Ellisor (pp. 8, 9); Thrips in Louisiana, by S. S. Sharp and C. O. Eddy (pp. 9, 10); Protecting Stored Rice from Insect Pests, by C. L. Stracener (pp. 11, 12); Some New Notes on the Sugar Cane Rootstock Weevil *Anacentrinus subnudus* Buch., by B. A. Osterberger and M. B. Christian (pp. 12–14); The Vegetable Weevil (*Listroderes obliquus* Gyll.), by I. J. Becnel (pp. 14–16); Borer Injury to Sugarcane in Louisiana in 1936, by J. W. Ingram and L. O. Ellisor (pp. 17–19); Varieties of Sugar Cane in Relation to Sugar Cane Borer Damage in 1936, by L. O. Ellisor and H. A. Jaynes (pp. 20–23); Research With Calcium Arsenate, by C. O. Eddy (pp. 23, 24); The Striped Flea Beetle, by A. L. Dugas (pp. 25–27); *Pseudococcobius terryi* Fullaway, a Hawaiian Parasite of the Gray Sugar Cane Mealybug in Louisiana, by E. K. Bynum (pp. 27–29); and Possibilities of Poison Dusts in Sweet Potato Weevil Control, by C. O. Eddy (pp. 29–32).

The insect record for Oklahoma, 1937, F. A. Fenton (*Okla. Acad. Sci. Proc.* [*Okla. Univ.*], *18* (*1938*), *pp. 38–43*).

Analysis of data in plat designs for cotton insect control, J. C. Gaines. (Tex. Expt. Sta.). (*Jour. Econ. Ent.*, *31* (*1938*), *No. 6, pp. 656–659*).—A discussion of the Latin square method, which has been successfully used in cotton insect control experiments in several localities.

Effectiveness of several insecticides against three cotton insects, G. L. Smith, A. L. Scales, and R. C. Gaines. (U. S. D. A.). (*Jour. Econ. Ent.*, *31* (*1938*), *No. 6, pp. 677–682, fig. 1*).—Studies of the effectiveness of insecticides used against the bollweevil, the cotton leaf worm, and the tarnished plant bug at Tallulah, La., in 1937 are reported upon. There were shown to be definite correlations between net bollweevil mortality and the following physical and chemical properties of calcium arsenate: Particle size, density, water-soluble As_2O_5 by the method of Pearce et al. (E. S. R., 75, p. 8), and molar ratio $CaO:As_2O_5$. "There appeared to be no significant correlations between such physical and chemical properties of calcium arsenate as angle of slope, loose bulking value at constant weight and constant volume, total As_2O_5, water-soluble As_2O_5 by the A. O. A. C. method, and free $Ca(OH)_2$. The effectiveness of both calcium arsenate and lead arsenate seems to vary inversely with the amount of carrier added. Calcium arsenate showed significantly higher net mortalities of bollweevils and cotton leaf worms than the four cryolites that were tested. There appeared to be a definite relation between net mortality and the amount of cryolite Na_3AlF_6 in the various samples of cryolite. In general, the highest percentages caused the highest net mortalities of bollweevils and leaf worms, though none was effective."

Control of insect pests of milled rice by improved storage bags, C. L. Stracener. (La. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 687, 688*).—It is pointed out that the milling of rice removes all insect pests and their eggs except the eggs of the rice weevil, which deposits them so deeply in the grain that one occasionally escapes the polishing machinery. The percentage of insects surviving from this source is so small that little damage results if the rice is protected from outside infestation at the time of milling. Tests made with multiwall paper bags gave 80 percent better control than the burlap bags commonly used for storage of milled rice, but it was found that small insects, such as the saw-toothed grain beetle, could crawl through the holes made in stitching. In a test of small three-ply bags with taped closures, each containing 10 lb. of milled rice, none of the bags, with the exception of one which had been penetrated by termites, was entered by insects. In a test made of paper bags with metal strips applied to the bottoms to hide the stitches and with the tops closed with such strips no insects, except termites, which had punctured three bags, had entered during an interval of nearly 8 mo. It is said that this method of closure should cost little, if any, more than stitching.

Cucumber and cabbage insects and their control, C. B. Dibble. (Mich. State Col.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 17 (1938), No. 8, p. 239*).

Control of cabbage insects, T. B. Randolph. (Tex. Expt. Sta.). (*Tex. Farming and Citric., 15 (1938), No. 4, pp. 7, 11*).

Pest control in the apple orchards of central Washington, J. Marshall. (Wash. Expt. Sta.). (*Oreg. State Hort. Soc. Ann. Rpt., 29 (1937), pp. 49–55*).

Small-fruit insects, R. L. Parker and P. G. Lamerson. (Kans. Expt. Sta.). (*Kans. State Hort. Soc. Bien. Rpt., 44 (1936–37), pp. 107–115*).

Citrus insect projects of the Orlando laboratory, H. Spencer and M. R. Osburn. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 728–730*).—A brief outline is given of control work with citrus insects at the U. S. D. A. Field Laboratory located at Orlando, Fla.

Biological control of insects through plant resistance, W. P. Flint and J. H. Bigger. (Ill. Expt. Sta. et al.). (*Canad. Ent., 70 (1938), No. 12, pp. 244–246*).—A brief review.

Synthetic organic compounds used as insecticides, R. C. Roark. (U. S. D. A.). (*Canad. Ent., 70 (1938), No. 12, pp. 248–253*).—Presented with a list of 22 references to the literature.

Progress report on the investigations of aliphatic thiocyanates as contact insecticides, J. T. CREIGHTON, W. P. HUNTER, and J. M. BROWNLEE. (Univ. Fla.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 745–750*).—Careful and intensive tests of the aliphatic thiocyanate, known chemically as β-butoxy-β-thiocyanodiethylether, conducted in Florida since the spring of 1936, are reported, the details of its toxicity to several ornamental plants being presented in table form.

The toxicity of ethylene oxide to Calandra oryzae, C. granaria, Tribolium castaneum, and Cimex lectularius, J. R. BUSVINE (*Ann. Appl. Biol., 25 (1938), No. 3, pp. 605–632, figs. 11*).—In studies reported the orders of resistance toward hydrogen cyanide, ethylene oxide, and sulfur dioxide are given for the granary weevil, rice weevil, red flour beetle, and bedbug. A list of 60 references to the literature is included.

The relative insecticidal effectiveness of some dusts containing rotenone, C. B. WISECUP. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 700–703*).—In laboratory tests with insecticidal dusts made from the powdered roots of *Derris elliptica, Lonchocarpus* sp., and *Tephrosia virginiana,* diluted with clay to contain uniform percentages of rotenone, 180 uniform quarter-grown and an equal number of half-grown larvae of the imported cabbageworm were used. "There was no significant difference in insecticidal efficiency between the averages of derris and the averages of cube powders containing nearly equal percentages of rotenone and total extractives. One sample of cube, however, was definitely inferior, contrary to what would have been expected from the chemical analyses. Samples of *T. virginiana* diluted 1:3 with clay, with resulting rotenone contents as low as 0.042 percent, were so toxic to quarter-grown larvae that no comparisons could be made. The same dilutions of *Tephrosia* tested with the more resistant half-grown larvae did not differ significantly among themselves except for the sample ground coarser than 60 mesh, which was inferior to the best. The best sample of diluted *Tephrosia* was not inferior to a derris dust containing 0.5 percent rotenone and was superior to one containing 0.1 percent rotenone."

A study of the decrease in effectiveness of cubé when exposed to weathering, C. B. WISECUP and L. B. REED. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 690–695*).—Eight combinations of cube were applied to cabbage in the field, and after as many as 5 days of exposure to weathering samples were fed to the imported cabbageworm under controlled laboratory conditions to obtain relative mortality records. There was found to be "a uniform decrease in mortality for all combinations, but the cube remaining after 5 days killed an average of 42 percent of the test insects as compared to a 17-percent mortality in the controls, indicating that, on the average, there was still toxic material remaining afer 5 days of exposure to weathering. Spray suspensions of cube with adherents and spreaders gave a greater total mortality over a period of 5 days than did dusts with four different diluents. However, the kind of spreader or the kind of diluent made no appreciable difference, indicating that the choice of either could be based on availability and price. Although the water suspension without adherents or spreaders utilized only about half as much cube to the acre as did the dusts, it gave equally good mortalities. Precipitation was second to duration of exposure in causing decreases in the effectiveness of cube dusts and sprays. This was indicated by a significant correlation ($r=0.74$) between the decrease in mortality during 4-day periods of exposure and the logarithms of the total precipitation recorded during these respective periods."

Notes on Utah Plecoptera and Trichoptera, G. F. Knowlton and F. C. Harmston. (Utah Expt. Sta.). (*Ent. News, 49 (1938), No. 10, pp. 284–286*).

Case studies in termite control, N. Turner and M. P. Zappe (*Pests, 6 (1938), No. 10, pp. 15–20*).

Fruit spotting caused by the green leafhopper, H. C. Lewis (*Calif. Citrog., 24 (1939), No. 3, pp. 108, 109, fig. 1*).—The fruit spotting of both navel and Valencia oranges, which has been of increasing importance in central California during the past few seasons, has been found to be caused by the potato leafhopper. The extent of damage has not been sufficient to affect the total crop, but many individual groves have been injured, sometimes as high as 40 to 50 percent of the fruit being spotted. In control work one of the several materials tested, namely, whitewash applied as a spray, has acted as a repellent. When applied with zinc at the rate of 24 lb. zinc sulfate to 150 lb. of hydrated lime with 1 pt. or 12 oz. blood albumin and 300 gal. water, it will control mottle-leaf and stimulate tree growth while repelling leafhoppers.

Sulfur and calcium arsenate for the control of the cotton flea hopper and the boll weevil, K. P. Ewing and R. L. McGarr. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 669–674*).—Tests with mixtures of calcium arsenate and sulfur for the cotton flea hopper and the bollweevil have shown the sulfur-arsenical mixture to give no better control than sulfur alone. Apparently sulfur alone gives adequate cotton flea hopper control when the infestation is low, while the sulfur-arsenical mixtures are more effective against high infestations.

"The 1:1 mixture of calcium arsenate and sulfur (rate of 7.8 lb. of calcium arsenate per acre-application) and the 1:2 mixture of calcium arsenate and sulfur (rate of 5.35 lb. of calcium arsenate per acre-application) . . . and calcium arsenate alone (rate of 8.22 lb. per acre-application) and the 1:2 mixture of calcium arsenate and sulfur (rate of 5.43 lb. of calcium arsenate per acre-application) . . . were equally effective in controlling bollweevils and each gave significant control. The 1:4 mixture of calcium arsenate and sulfur (rate of 3.2 lb. of calcium arsenate per acre-application) was not so effective in controlling [the bollweevil]."

The relation of wind currents, as indicated by balloon drifts, to cotton flea hopper dispersal, J. C. Gaines and K. P. Ewing. (Tex. Expt. Sta. and U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 674–677, fig. 1*).—In the studies reported catches on tall traps have shown that the adult cotton flea hopper is to be found in fairly large numbers from 21 to 26 ft. in the air. "Collections made by airplane show adult flea hoppers as high as 2,000 ft. above the ground. A heavy dispersal of flea hoppers into cotton in Calhoun County, Tex., from outside the area which was cleaned of *Croton* shows that dispersal of this insect is at least 20 miles. The prevailing wind currents in south-central Texas, as indicated by balloon drifts in 1937, are to the north and north-east from the light-soil areas toward the heavy-soil areas. One balloon drifted 155 miles at an average rate of 29.8 miles per hour. Twelve balloons found on the same day that they were released drifted an average of 62.4 miles at the rate of 13.3 miles per hour. The average drift of 346 balloons recovered from 3,334 releases was 42.6 miles." This has led the authors to conclude that adult flea hoppers may transfer long distances from their spring host plants, which grow abundantly in the light-soil area, to cotton and other native spring food plants in the heavy-soil areas, thereby accounting for the injurious infestations in large areas of cotton which are comparatively free of initial infestations of flea hoppers early in the spring.

Aphids feeding on celery in California, E. O. Essig (*Hilgardia* [*California Sta.*], *11* (*1938*), *No. 9, pp. 459–492, figs. 12*).—The role of aphids as transmitters of virus diseases of celery in California has become of increasing importance in recent years. With the greater financial losses borne by producers of the crop has come the need for information as to the identity and importance of each form. In the present account 11 species met with on celery in the State that may be considered as potential pests are dealt with, namely, the cotton or melon aphid, the green peach aphid, the celery leaf aphid *Aphis apigraveolens* Essig n. sp., the celery aphid *A. apii* Theob., the rusty-banded aphid A. *ferruginea-striata* Essig n. sp., the cow parsnip aphid *A. heraclella* Davis, the erigeron root aphid *A. middletonii* Thos., the yellow willow aphid *Cavariella capreae* (F.), the lily aphid *Myzus circumflexus* (Buckt.), the foxglove aphid *M. convolvuli* Kltb., and the honeysuckle aphid *Rhopalosiphum melliferum* (Hottes). The majority of these are thought to be introduced forms. Nearly all have a number of hosts. The cotton or melon aphid, the green peach aphid, *M. circumflexus*, and *M. convolvuli* have many and varied hosts. They all appear to reproduce parthenogenetically continuously during the entire year, although there is a noticeable reduction of individuals during the winter months. A three-page list of references to the literature is included.

The cotton aphid in relation to the pilosity of cotton leaves, E. W. Dunnam and J. C. Clark. (U. S. D. A.). (*Jour. Econ. Ent.*, *31* (*1938*), *No. 6, pp. 663–666, fig. 1*).—In tests conducted at Stoneville, Miss., in 1937 with cotton varieties having different degrees of pilosity, the cotton aphid population increased in direct proportion to the number of hairs on the lower leaf surfaces. There was a significant increase in aphid population on all types of cotton following three or seven applications of calcium arsenate dust, but the ratio of increase was greater on the glabrous varieties. No correlation was found between the numbers of parasitized aphids and the pilosity of leaves, although the percentage of parasitization was greater on the glabrous types of cotton with the smaller aphid populations. The data presented do not explain the differences in the ratio of aphid increases on dusted cotton.

Control of the poinsettia root aphid, G. A. Bieberdorf and F. A. Fenton. (Okla. Expt. Sta.). (*Jour. Econ. Ent.*, *31* (*1938*), *No. 6, pp. 733, 734*).—Control tests with the poinsettia root aphid (*Pemphigus* sp.), which first came to the station's attention in December 1937, at which time it was found infesting practically mature poinsettia plants in a greenhouse at Ardmore, Okla., are briefly reported. In these tests dusting the earth ball and inside of the pot with a 5-percent nicotine dust gave good control with little root injury. "Loosening the earth ball and submerging it in a solution of lemon oil, Black Leaf 40, soap, and water which had been previously heated to 110° F. gave good results. A similar treatment in which the lemon oil was omitted gave as good results."

Physiological relationships between insects and their host plants.—I, The effect of the chemical composition of the plant on reproduction and production of winged forms in Brevicoryne brassicae L. (Aphididae), A. C. Evans (*Ann. Appl. Biol.*, *25* (*1938*), *No. 3, pp. 558–572, figs. 4*).—The studies reported have shown that under late summer conditions of light the rate of reproduction of the cabbage aphid is positively correlated with the nitrogen content of the host plant and in particular with the protein content. The formation of winged forms is negatively correlated with the same factors. The chemical composition of the plant affects the rate of growth, length of larval period, and final pupal weights of the cabbage butterfly *Pieris brassicae*, and influences the amount of food eaten.

Additional aphids from Colorado, M. A. Palmer. (Colo. Expt. Sta.). (*Ann. Ent. Soc. Amer., 31 (1938), No. 3, pp. 352–357, figs. 6*).—Reporting further (E. S. R., 77, p. 513), a new name, *Aphis coweni*, is proposed for *A. veratri* Cowen (Gillette and Baker (E. S. R., 7, p. 230)), a preoccupied name. Five species, *A. neogillettei*, *Cerosipha roripae*, *Capitophorus filifoliae*, *C. gnaphalodes*, and *Macrosiphum purshiae*, all collected from native plants in Colorado, are described as new to science.

Physiological conditions which produce wing development in the pea aphid, C. W. Schaefer. (Wis. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *57 (1938), No. 11, pp. 825–841, figs. 2*).—Studies conducted during 1935–36, the details of which are given in nine tables, show that the appearance of winged offspring of the pea aphid is associated with a concentration of the body contents of the parent. "The alimentary tract of the pea aphid is so constructed that it adequately eliminates waste substances only so long as fluid is ingested in sufficient volume. There appears to be no provision for voiding unnecessary products when the supply of fluid is insufficient for this purpose. Lack of fluid, together with rapid evaporation from the body of the parent aphid, causes a concentration of the waste substances. These accumulated 'wastes' in the adult in the form of proteins and carbohydrates appear to initiate wing development. The appearance of apterous individuals appears to be due to (1) the lack of these waste substances in the parent, or (2) to the presence of a sufficient volume of fluid intake to carry them away in solution as honeydew."

A list is given of 35 references to the literature cited.

Host-determined morphological variations in Lecanium corni, W. Ebeling (*Hilgardia* [*California Sta.*], *11 (1938), No. 11, pp. 613–631, figs. 10*).—In the study reported the European fruit lecanium was selected for experimentation for the effect of the host species on the morphology of insects because of the great morphological variation in this species on its various host plants in nature. Much of the synonymy of the species has resulted from the confusion arising from such variability. Thus, individuals taken from the apricot have large bodies and short appendages, while those taken from the Christmasberry have small bodies and long appendages. The antenna and leg formulas, which show the ratios of the lengths of the segments of these appendages to one another, are also different on the two hosts. When the distributions for the two hosts are platted separately, the curves each closely approximate the "normal curve" and overlap only slightly.

There are 13 references to the literature.

Control of the obscure scale on pecan with low concentrations of lubricating oil emulsions, W. C. Pierce. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 722–724*).—In these experiments most of the female obscure scale on pecan surviving thorough applications of 2, 3, and 4 percent oil emulsion sprays failed to develop eggs and produce young. "The use of a 2 percent oil emulsion spray is suggested for holding in check infestations of the obscure scale on pecan trees low in vigor or growing in poor upland soils. Three percent oil emulsion sprays effect a much higher direct kill of scale than 2 percent concentrations, and their general use in control of the obscure scale on pecan trees growing in alluvial soil seems justified. A 4 percent oil emulsion was the lowest concentration that consistently effected a high degree of control by direct kill of the scale, but severe injury to the pecan tree has resulted from the use of this concentration."

Effect of spray residues on scale insect populations, M. R. OSBURN and H. SPENCER. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 731, 732*).—The authors consider it evident that in attempting to prolong the effectiveness of sulfur sprays used for the control of the citrus rust mite, adhesive materials which may leave heavy, inert residues should be avoided because of increases in scale insect population that might follow their use.

Observations on cabbage worm populations at Baton Rouge, La., C. E. SMITH and R. W. BRUBAKER. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 697–700*).—Report is made of the populations of cabbageworms as recorded in four experiments conducted in a survey of conditions relating to cabbage and cabbageworms at Baton Rouge in 1936 and 1937. "It was found that the cabbage looper is the predominating species on fall crops and appears late on spring crops. The imported cabbageworm is the most important, if not the most abundant, species on spring crops and appears late on fall crops in damaging numbers. The diamondback moth ranks third in importance and may become abundant on either spring or fall crops. The cabbage webworm the cross-striped cabbageworm, and the several species of Agrotinae are most abundant on fall crops."

Biological studies of the tomato worm on tobacco in Florida, 1936 and 1937, A. H. MADDEN and F. S. CHAMBERLIN. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 703–706*).—Observations of the biology of the tomato worm on tobacco, conducted at Quincy, Fla., in 1936 and 1937, are reported, together with notes on control measures. In the absence of an entirely satisfactory insecticide, "the information obtained in these studies indicates the practicability of supplemental methods of control, including the destruction of the tobacco stalks directly after harvest, fall plowing of infested tobacco fields, and the use of moth traps."

Observations on the hornworms attacking tobacco in Tennessee and Kentucky, J. U. GILMORE. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 706–712*).—Studies of the biology and natural enemies of hornworms (the tomato worm and the tobacco worm) attacking tobacco, conducted in Tennessee and Kentucky, are reported.

Experiments on the control of the velvetbean caterpillar (Anticarsia gemmatilis (Hbn.)), L. O. ELLISOR, J. H. GAYDEN, and E. H. FLOYD. (La. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 739–742*).—In control experiments with the velvetbean caterpillar, conducted in the fall of 1937, cryolite applied at the rate of from 9 to 10 lb. per acre gave excellent control. "A mixture composed of 1 part of cryolite and 1 part of talc, applied at the rate of 12, 14, and 16 lb. per acre on three respective test plats, gave good field control of caterpillars. Mixtures composed of 1 part of cryolite and 2 parts of talc, applied at the rate of 15 and 13 lb. per acre on two respective test plats, and 1 part of cryolite and 3 parts of talc, applied at the rate of 15 lb. per acre in two tests, gave fair field control of caterpillars. Two brands of safened calcium arsenate, each applied to three test plats, varying in rate of application from 6 to 13 lb. per acre, gave good field control of caterpillars but damaged the soybean plants."

Recent experiments with ethylene dichloride emulsion for peach borer control, O. I. SNAPP. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 725–727*).—The results of experiments carried on with ethylene dichloride emulsion for the control of the peach borer in 1936 and 1937, in continuation of the work previously noted (E. S. R., 76, p. 509), are reported. In all of the experiments the ethylene dichloride emulsion caused injury to only two trees, one 2-year-old tree in Georgia treated in October 1937 with 0.25 pt. of 20-percent emulsion and one 3-year-old tree in New York treated in November 1937 with 0.5 pt. of 15-percent emulsion. At the same time paradichlorobenzene caused injury to a number of the younger trees used in the tests. During the experiments the higher dosages of the ethylene dichloride emulsion gave a high degree of control of the peach borer. "This material maintained its effectiveness late in the fall in New York and during the winter in Georgia, when soil temperatures were too low for the effective use of paradichlorobenzene. Good results were obtained both by spraying and by pouring the material. The spraying method appears less likely to result in injury to the trees, probably because it gives a more even distribution of the emulsion. In the cold weather tests of paradichlorobenzene some of the records were taken 4 to 7 days after treatment, and the rest were taken after intervals of 1 mo. In neither case was there indication of much borer mortality."

New chemical to control peach borer, D. M. Daniel (*Farm Res.* [*New York State Sta.*], *5* (*1939*), *No. 1*, *pp. 1, 10*, *fig. 1*).—In this practical discussion attention is drawn to the fact that when compared with other materials ethylene dichloride emulsion has many advantages. Emulsified with potash fish-oil soap and diluted with water, it can be applied directly without injury to young peach trees, and is more efficient than paradichlorobenzene crystals. Application can extend later into the fall than with paradichlorobenzene, which requires a soil temperature of 60° F. or above to be effective. The ethylene dichloride emulsion has given excellent control in western New York when applied as late as the middle of November. Its cost is a little less than paradichlorobenzene crystals and considerably less than paradichlorobenzene-cottonseed oil emulsion.

A new woodboring lepidopteron, injurious to fruit trees in Argentina (family Stenomidae), A. Busck. (U. S. D. A.). (*An. Soc. Cient. Argentina*, *126* (*1938*), *No. 4*, *pp. 280–284*, *figs. 2*; *Span. abs.*, *p. 284*).—Under the name *Timocratica haywardi* n. sp. description is given of a lepidopteron which bores in the solid live wood of trunks and branches of apple, plum, peach, and other fruit trees and *Psidium* and *Eugenia edulis* in Concordia, Argentina. It is said to have caused severe damage to fruit trees.

Controlling the hop-vine borer, R. O. Magie (*Farm Res.* [*New York State Sta.*], *5* (*1939*), *No. 1*, *pp. 11, 12*, *fig. 1*).—The hopvine borer or grub, *Gortyna immanis*, which has infested the hopyards of New York State for over 70 yr., was a source during 1938 of more than usual damage. In some yards as much as one-third of the hop plants were either killed outright or so weakened that rots completed their destruction. Reference is made to fumigation work during a single dry season with calcium cyanide. Pending further work it is suggested that the grass in and around the hopyard be destroyed by plowing or otherwise in the late fall or early spring.

A decade with the oriental fruit moth, D. M. Daniel (*Farm Res.* [*New York State Sta.*], *5* (*1939*), *No. 1*, *pp. 2, 8*, *fig. 1*).—A practical review is given of insect parasite control work with the oriental fruit moth. It is shown that these parasites, of which *Macrocentrus ancylivorus* has been responsible for over 90 percent of parasitism, have played a large part in the reduction of infestation.

The orange tortrix (Argyrotaenia citrana), A. J. Basinger (*Hilgardia* [*California Sta.*], *11* (*1938*), *No. 11*, *pp. 633–669*, *figs. 16*).—The biology and economic importance of the orange tortrix, the most important of several species of small moths, the larvae of which have caused damage for many years to the orange and occasionally to other citrus fruits in southern California, are dealt with. Other species considered to a lesser extent are *Holcocera iceryaella* (Ril.), *Platynota stultana* Wlsm., and *Pyroderces rileyi* (Wlsm.).

The orange tortrix, first reported injurious to citrus in 1885 and described in 1889, is thought to be native to the extreme southwestern part of the United States and perhaps to contiguous Mexico. Since the original report infestations have appeared sporadically every few years in the principal citrus sections of southern California. While its distribution extends from the southern to the northern part of the State, the localities of greatest abundance seem to be in the region of the coastal influence of the southern part of the State. Some 40 species of great variety, including both native and introduced plants, have been recorded as hosts. Its economic importance is due to the scarring of and to eating holes into the fruit. There are two broods in the Corona district, the spring brood requiring about 3 mo. and the summer-fall brood about 9 mo. In the coastal areas all stages may be present at any given time with no indication of the broods. Of the 12 recorded primary parasites and 5 secondary parasites, *Apanteles aristoteliae*, *Hormius basalis*, *Exochus* sp., and *Campoplex* n. sp. are the most common primary forms. These seem to be generally distributed with the insect and serve as a severe check.

A list of 19 references to the literature cited is included.

Substitutes for lead arsenate used as sprays for codling-moth control during the season of 1936, R. L. Parker and P. G. Lamerson. (Kans. Expt. Sta.). (*Kans. State Hort. Soc. Bien. Rpt., 44 (1936–37), pp. 115–121*).—In experiments reported, much of the ovicidal value of the more effective lead arsenate-summer oil emulsion spray combinations was a negligent factor due to the lack of abundant and prolonged periods of oviposition. The details of the work, which are given in five tables, show lead arsenate to have been the most effective of all the insecticides tested.

Substitutes for lead arsenate used as sprays for codling-moth control during the season of 1937, R. L. Parker and P. G. Lamerson. (Kans. Expt. Sta.). (*Kans. State Hort. Soc. Bien. Rpt., 44 (1936–37), pp. 121–130*).—The details of comparative tests of insecticides for the control of the codling moth in Blair, Kans., during 1937 are given in five tables. Lead arsenate with or without an oil emulsion was more effective against the codling moth than other arsenates or organic insecticides used in this experimental work.

A five-year summary of codling-moth control in Kansas (1933–1937), R. L. Parker and P. G. Lamerson. (Kans. Expt. Sta.). (*Kans. State Hort. Soc. Bien. Rpt., 44 (1936–37), pp. 130–133*).—All the other insecticides tested proved to be decidedly inferior to lead arsenate or combinations of lead arsenate and summer oil emulsions. The most successful combinations of lead arsenate with stickers and spreaders are summer oil emulsions, kerosene and soap (when properly mixed), summer oil emulsion and soap, and Petrocide.

Summary of results of filbert moth spray tests for 1937, B. G. Thompson. (Oreg. State Col.). (*Oreg. State Hort. Soc. Ann. Rpt., 29 (1937), pp. 144–146*).—The results of applications of various insecticides as sprays in the control of the filbert moth *Melissopus latiferreanus*, the most important insect pest of the filbert occurring in Oregon, are reported in table form. Natural enemies of this pest, particularly the egg parasite *Trichogramma evanescens* Westw., are important factors in its control.

Pink bollworm control in Southeastern States, L. F. Curl. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 652–656*).—This is a report of work with the pink bollworm, particularly its occurrence and eradication in northern Florida and south-central Georgia. Eradication work with the pest in the wild cotton plant in southern Florida, in which it was found growing almost continuously on the keys from Miami to Key West, a distance of 175 miles, is considered at length. Progress has been made toward final eradication of the wild cotton, and the clean-up measures have already resulted in substantial decrease in the degree of infestation in what is still remaining.

Toxicity of ten arsenical poisons to fifth instar cotton leaf worms, R. C. GAINES. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 659–663, fig. 1*).—Report is made on the median lethal doses of six calcium arsenates, lead arsenate, paris green, and two mixtures of paris green and calcium arsenate as determined for fifth instar cotton leaf worms. "The median lethal doses for the calcium arsenates range from 0.12 to 0.72 mg per gram of body weight, for a mixture of 7.5 percent paris green and 92.5 percent calcium arsenate 0.09 mg, for a mixture of 10 percent paris green and 90 percent calcium arsenate 0.04 mg, for lead arsenate 0.02 mg, and for paris green 0.01 mg."

Recent field tests of insecticides for control of the cotton bollworm, R. W. MORELAND. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 666–668*).—Report is made of control work with the second generation of the bollworm conducted in eastern Texas during the seasons of 1936 and 1937, supplementing that by Moreland and Bibby, previously noted (E. S. R., 66, p. 649).

Studies on the corn-borer (Pyrausta nubilalis Hbn) in connection with the infestation of hops (Humulus lupulus Lin.) and millet (Panicum miliaceum Lin.) [trans. title], E. JUDENKO (*Prace Wydz. Chorób i Szkodnik. Roślin Państ. Inst. Nauk. Gosp. Wiejsk. Bydgoszcz, No. 17 (1938), pp. 19–122, pls. 3; Eng. abs., pp. 120–122*).—This report of studies of the life history, bionomics, and control of the European corn borer, the details of which are given in 37 tables, includes a list of 68 references to the literature. There is but one generation of the pest in the region of Pulawy, located 120 km southeast of Warszawa (Warsaw). Food plants of the larvae recorded in Poland include hops, millet, maize, hemp, *Artemisia vulgaris*, *Amarantus retroflexus*, and *Panicum crus-galli*. Hops and millet are seriously infested in the areas where chiefly cultivated. At Pulawy maize has been attacked only when neighboring millet fields were infested.

A septicemia of the southern armyworm caused by Bacillus cereus, F. H. BABERS. (U. S. D. A.). (*Ann. Ent. Soc. Amer., 31 (1938), No. 3, pp. 371–373*).—In the course of the study of an epidemic disease of the southern armyworm that appeared in greenhouse cages, a bacillus was isolated from the blood. It was shown to cause a pathogenic septicemia when injected into normal larvae of that species and also in the American cockroach. The cultural characteristics of the organism were found to be those of *B. cereus*, and the organism was classified as of that species.

Asthma due to sensitization to a mushroom fly, Aphiochaeta agarici, R. A. KERN (*Jour. Allergy, 9 (1938), No. 6, pp. 604–606*).—A report of the first case of asthma found to be due to sensitization to a species of mushroom fly, *A. agarici*.

Taxonomic notes on the dipterous family Chloropidae, I, C. W. SABROSKY. (Mich. Expt. Sta.). (*Jour. N. Y. Ent. Soc., 46 (1938), No. 4, pp. 417–434, figs. 4*).—Included in this contribution are descriptions of two new species.

Additions to the New York State list of Tabanidae, L. L. PECHUMAN. (Cornell Univ.). (*Jour. N. Y. Ent. Soc., 46 (1938), No. 4, pp. 457–460*).—These data supplement the records issued in a list by Leonard (E. S. R., 58, p. 754).

Soil moisture and its relation to the mortality of Hypoderma pupae, W. G. BRUCE. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 639–642, figs. 2*).—The study conducted has shown that ox warble pupae (*Hypoderma* spp.) will not develop in soils having a moisture content in excess of 20 percent. The exact minimum soil moisture content that produces mortality of *Hypoderma* pupae has not been ascertained but probably varies with the type of soil and very likely is not in excess of the hygroscopic coefficient.

Effects of some common poisons in sucrose solutions on the chemoreceptors of the housefly (Musca domestica L.), C. C. Deonier. (Iowa State Col.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 742–745*).—The author has found that in the adult housefly the chemoreceptors of the proboscis were more sensitive to certain compounds than were the chemoreceptors on the tarsi. "Responses of the proboscis were initiated by tarsal stimulations with 1 M sucrose which contained 0.5 percent mercuric chloride. The chemoreceptors of the proboscis were definitely negative to a concentration of 0.05 percent or above. The presence of mercuric chloride at a concentration of 0.025 percent or greater affected the feeding of houseflies on 1 M sucrose. Concentrations of the following compounds in 1 M sucrose solution were not repellent and did not materially inhibit feeding: Sodium fluoride at 3.5 percent, sodium fluosilicate at 0.5 percent, and arsenious acid at a concentration of 1.84 g As_2O_3 per 100 cc of solution Arsenic acid was repellent at concentrations above 0.25 percent. A 5-percent concentration of mercuric chloride had a definite inhibitory effect on the chemoreceptors of the tarsi. This prevented the stimulation of proboscis responses in subsequent sucrose tests which followed immediately. Gradual recovery occurred in some of the flies after 1 to 5 hr., and normal responses of the proboscis were obtained with 1 M sucrose when the tarsi were stimulated."

A note on the overwintering of the housefly (Musca domestica), P. Sen (*Indian Jour. Med. Res., 26 (1938), No. 2, pp. 535, 536*).—The author concludes that the small number of eggs found to be deposited by the housefly during the winter months and the very appreciable reduction in the length of time required for the egg to hatch are probably provisions to insure better chances for the species to survive the winter when conditions for the propagation of the flies are very unfavorable.

On the number of eggs of the common house-frequenting flies of Calcutta, D. N. Roy (*Indian Jour. Med. Res., 26 (1938), No. 2, pp. 531–533*).—Counting the eggs in ovaries of gravid females was found to afford an easy means of ascertaining the number that the fly is capable of depositing in a batch. The 3 common species of house-frequenting flies in Bengal, e. g., the oriental housefly, *Musca nebulo*, and *Chrysomyia megacephala*, lay on an average of 97, 75, and 182 eggs, respectively, in one laying. Though morphologically the housefly and the oriental housefly resemble each other, they differ in regard to the number of eggs they usually deposit in a batch. When one batch of eggs is laid, some time must elapse before another batch becomes mature.

Seasonal variations in the abundance of Cochliomyia spp., Phormia spp., and other flies in Menard County, Tex., E. C. Cushing and H. E. Parish. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 764–769, fig. 1*).—This 4-yr. study, conducted in connection with the work above noted, relates to seasonal variations in abundance of the screwworm, the secondary screwworm, and wool maggot flies (*Phormia* spp.), over ranch land in Menard County, Tex., the details being given in four tables. The data obtained indicate that during this period four main peaks in the comparative abundance of *Cochliomyia* spp. occurred during each season, namely, May 10 to 20, July 9 to 19, September 7 to 17, and October 17 to November 6. "Our observations in Menard County show there are very few screwworm cases in livestock prior to May 10. Therefore, we are of the opinion that such operations as shearing, marking, castrating, and dehorning should be completed and animals bred so the young will drop before this date. The time of year best suited for fall shearing of sheep and goats appears to be the last 10 days of August or after September 27 and before October 17. Sheep should be 'tagged' (wool trimmed from breech) during the latter part of February or early in March to avoid possibility of infestations of wool maggots."

The incidence and importance of Cochliomyia americana and other wound-invading species, J. M. Brennan. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 646–649*).—The screwworm has been shown to be responsible for 86 percent of the infestations recorded. *Phormia regina* is the most important of the secondary species and is responsible for 8 percent of such infestations. The secondary screwworm is not important as a myiasis-producing species, being responsible for only 1 percent of the infestations.

The screwworm and the Gulf coast tick in southern Texas, W. J. Spicer and W. E. Dove. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 642–646*).—The authors have found that (1) cases of screwworms are more numerous along the coast than inland, (2) the problem of controlling screwworms in southern Texas involves also the problem of controlling the Gulf coast tick, and (3) it is highly desirable to adopt practices which will keep to a minimum the infestations of both ticks and screwworms.

Locations for blowfly traps: Abundance and activity of blowflies and other flies in Menard County, Tex., H. E. Parish and E. C. Cushing. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 750–763, fig. 1*).—The results of a 4-yr. test to determine the comparative abundance and activity of blowflies, especially species of *Cochliomyia* and *Phormia*, as indicated by the numbers of each species taken in fly traps placed in different locations and surroundings at Menard, Tex., from April 1, 1929, to March 31, 1933, are reported at length, the details being given in eight tables.

Blowfly traps placed in the open sunlight, in locations where they are protected from direct wind and surrounded with timber and underbrush of medium density, were found more attractive to *Cochliomyia* spp. than traps in other locations. "Wool maggot flies (*Phormia* spp.) prefer more shaded areas and higher humidity, with more surrounding timber and underbrush. Regardless of other factors, except protection from wind, the species of *Cochliomyia* appear to be more active and abundant in the open sunlight, while *Phormia* spp. seem to prefer medium shade. Since the comparative abundance of the two species of *Cochliomyia* [the screwworm and the secondary screwworm] and species of *Phormia* were not determined for any of the locations, it cannot be stated in which type of location each species was most numerous."

Sheep blow-fly investigations.—VII, Observations on the development of eggs and oviposition in the sheep blow-fly Lucilia sericata Mg., R. P. Hobson (*Ann. Appl. Biol., 25 (1938), No. 3, pp. 573–582*).—An investigation made of the effect of temperature on the time required for the development of the ovaries in *L. sericata* is reported in this further contribution (E. S. R., 79, p. 225). "It has been shown that two meat meals are essential for the development of mature eggs in the ovaries. This applies also to the further production of eggs after oviposition. Neither plant materials nor animal excreta can replace meat in the diet of the female fly if eggs are to develop in the ovaries. Various products of putrefaction stimulate gravid females to oviposit, but these substances do not attract flies from a distance."

Conditions involved in the severe losses of newly set tobacco in North Carolina, 1937, W. A. Shands, R. F. Poole, and E. G. Moss. (U. S. D. A. and N. C. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 715–719, figs. 3*).—Severe losses in stands of newly transplanted tobacco in the western and north-central sections of North Carolina, due to feeding of adults of the tobacco flea beetle on the plant tops and by larvae of this beetle on the roots and in the stems, are reported.

Mass egg production by the coccinellid Hippodamia convergens Guer., G. W. HAUG. (Ohio State Univ.). (*Ann. Ent. Soc. Amer., 31 (1938), No. 3, pp. 366–369, figs. 3*).—Further observations of the convergent ladybeetle (E. S. R., 80, p. 519) have shown that unless proper methods are used the females of this predator will not produce eggs. "If methods are only partly satisfactory, all or part of the eggs are eaten a short time after deposition. Equipment and methods have been developed that obtain egg-laying efficiency. When fed an excess of living poplar gall aphids (*Pemphigus populicaulis*), a daily average of 35 overwintering females deposited 17,933 eggs in 10 days."

The relation of nutritional levels to the growth of populations of Tribolium confusum Duval.—I. Growth of larval, pupal, and adult populations in cornmeal and in cornmeal supplemented with yeast, R. J. BUSHNELL. (Univ. Ga.). (*Ann. Ent. Soc. Amer., 31 (1938), No. 3, pp. 345–351, fig. 1*).—It was found that yellow corn meal to which yeast has been added serves as a superior medium to corn meal in which to culture the confused flour beetle. "Yeast appeared to enhance the egg production of female flour beetles as indicated by the records of young larvae in the experimental series as compared with the records in the control series. Larvae grow more rapidly in the yeast-corn meal medium as compared with corn meal alone. A higher percentage of individuals survive the metamorphic period when reared in the corn meal-yeast medium as compared with those reared in corn meal without the yeast. The resulting adult populations are consistently higher per gram of culture medium for the corn meal plus yeast medium as compared with the medium of corn meal without the yeast."

The genus Chramesus Leconte in North America (Coleoptera: Scolytidae), M. W. BLACKMAN. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 28 (1938), No. 12, pp. 534–545, figs. 9*).—Eight species of scolytid beetles of the genus *Chramesus* are recognized from North America, three being described as new, of which one, *C. mimosae*, was taken from mimosa at Brownsville, Tex., and Monterrey, Mexico. The North American members of this genus are said to breed entirely in deciduous trees and shrubs, utilizing only material which is severely injured, decadent, or dead.

Soil sterilization experiments on killing larvae of the white-fringed beetle Naupactus leucoloma Boh., L. L. ENGLISH and C. P. GRAHAM. (Ala. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 769–773*).—Experiments with a number of insecticides for sterilizing soil containing larvae of the white-fringed beetle *N. leucoloma* gave negative results at concentrations that were safe for nursery plants. Potassium cyanide in aqueous solution was the only chemical that showed definite toxicity to the larvae in the soil, and offers promise for soil that does not contain plants. Results with hot water, steam, and electrical heating devices were negative.

Laboratory tests with insecticides against the vegetable weevil, K. L. COCKERHAM and O. T. DEEN. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 695–697*).—In experiments with insecticides used against the larvae of the vegetable weevil there was no significant difference in toxicity between the pyrethrum and clay dust mixture and calcium arsenate dust. "Calcium arsenate was, however, more effective against the adults. These two materials were superior to all the other insecticides applied against the larvae. Sulfur, undiluted, and derris dust mixture containing 2 percent of rotenone were effective against young larvae, sulfur causing 80 percent mortality and the dust mixture of 2 percent rotenone causing 82.22 percent mortality. The 1 percent rotenone dust mixture killed 44.44 percent of the small larvae. The dust mixture containing 0.5 percent of rotenone, the derris spray containing 0.025 percent of rotenone in water, with or without a spreader, and the spray containing 2 lb. of phenothiazine to 50 gal. of water were not effective against the larvae. Sodium fluoride bait was practically as toxic as calcium arsenate dust against vegetable weevil adults, and crude arsenic bait was next in effectiveness. Preliminary field experiments in Louisiana indicated that rotenone compounds may be effective against vegetable weevil larvae if applied at frequent intervals to plants infested with small larvae."

Some new notes on the sugarcane rootstock weevil Anacentrinus subnudus Buch., B. A. Osterberger and M. B. Christian. (La. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 688–690*).—The sugarcane rootstock weevil *A. subnudus*, which has been known to be present in the sugarcane section of Louisiana since April 1910, is capable of seriously injuring stands of sugarcane in both plant and stubble crops under Louisiana conditions. It has been found abundant in south Louisiana, feeding on sugarcane, corn sorghum, and nine wild host plants of the *Paspalum* family. It was found that activity is continuous, with the life cycle as short as 43 days during warm months and extending over a rather long period during cold weather.

A progress report on the control of boll weevils on sea-island cotton, P. M. Gilmer. (U. S. D. A., Ga. Coastal Plain and Fla. Expt. Stas., et al.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 684–687*).—In experimental work at Tifton, Lake Park, and near Savannah, Ga., and at Gainesville, Fla., in 1937, dusted plats and fields uniformly showed the best protection from late injury to bolls and the largest increases in yields. It was found that under the conditions that existed that year the bollweevil could be controlled on sea-island cotton. This cotton seems to be more susceptible to arsenical injury than upland cotton, and this is a serious problem, since a prolonged poisoning schedule seems necessary for weevil control.

Test of insecticides for control of the boll weevil, with and without untreated checks, C. F. Rainwater. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 682–684*).—In two experiments conducted near Florence, S. C., in 1937 calcium arsenate was superior to 50–50 or 33⅓–66⅔ calcium arsenate plus lime for bollweevil control. "The 10–90 pyrethrum plus sulfur and 33⅓–66⅔ barium fluosilicate plus talc showed very little if any value as insecticides for bollweevil control. No significant difference was shown between 36 percent cryolite and 33⅓–66⅔ calcium arsenate plus lime for bollweevil control. Owing to the influence of aphids that often follow the application of arsenical insecticides, yield records may not be reliable criteria for determining the actual effect of an insecticide on the bollweevil. The need of an insecticide that does not increase the aphid infestation or that will control the aphids along with the bollweevil is clearly demonstrated in these experiments."

Studies on American foul brood of bees.—II, The germination of the endospores of Bacillus larvae in media containing embryonic tissues, H. L. A. Tarr (*Ann. Appl. Biol., 25 (1938), No. 3, pp. 633–639*).—In further studies (E. S. R., 78, p. 227) the tissues of the developing chicken embryo were found to form a more suitable substrate for the germination of the endospores of *B. larvae* than any other medium thus far described. "The addition of beef digest broth to a medium of minced chicken embryo hinders rather than promotes the germination of *B. larvae* spores. Concentrations of reducing sugars as high as 12.5 percent cause no apparent hindrance in the germination of *B. larvae* spores in embryo medium."

Note on the populations of Formica exsectoides, W. T. M. FORBES. (Cornell Univ.). (*Ann. Ent. Soc. Amer., 31 (1938), No. 3, p. 358, fig. 1*).—This contribution supplements that of Cory and Haviland (E. S R., 80, p. 520).

The fire ant (Solenopsis spp.) as a pest of quail, B. V. TRAVIS. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 649–652*).—Report is made of studies of the relationship of fire ants, especially *S. geminata* (F.), to quail and other ground-nesting birds in the southern United States. Detailed information concerning the actual destructiveness of these ants to quail is available from a single area, Forshala plantation, near Tallahassee, Fla. Control methods are considered.

The Texas leaf-cutting ant and its control, E. V. WALTER, L. SEATON, and A. A. MATHEWSON (*U. S. Dept. Agr. Circ. 494 (1938), pp. 19, figs. 5*).—This contribution reports upon the biology of and control experiments with *Atta texana* Buckl., a leaf-cutting ant found in Texas and Louisiana. It is the most destructive of the fungus-growing ants found in the United States, where it causes an estimated loss of about $5,000,000 annually. The damage is due chiefly to the cutting of green vegetation, which is taken into the nest and used as a medium on which to grow a fungus that constitutes the food of the ant. The average nest of this ant covers approximately 1,455 sq. ft. of surface area, with 80 cu. ft. of excavated soil in the mounds. Its control is complicated by the presence of several females, usually scattered throughout the nest. Of the various materials tested, carbon disulfide was found to be the most effective both as a fungicide and as an insecticide, and hence the best material to use in the control of this ant. Several methods of application were tested, the best of which appear to offer a practical means of controlling this insect. Some 50 species of insects and arachnids have been found within the nests in association with the ants. The larvae of *Cotinis longitarsis* feed on the waste material in the nest, and it is suggested that orchardists might protect their fruit from the ravages of the *Cotinis* adults by controlling the leaf-cutting ant.

The relation of host physiology to development of the braconid parasite Chelonus annulipes Wesmael, W. G. BRADLEY and K. T. ARBUTHNOT. (U. S. D. A.). (*Ann. Ent. Soc. Amer., 31 (1938), No. 3, pp. 359–365, fig. 1*).—Observations of the biological reaction of *C. annulipes* when reared on several different hosts, made during the course of several years' study of its use as a parasite of the European corn borer at Arlington, Mass., and Toledo, Ohio, are reported. Reared on both multiple- and single-generation strains of the European corn borer, on *Pyrausta penitalis* Grote, and on the Mediterranean flour moth, its growth seems to be unaffected by meteorological or other external environmental conditions except insofar as they affect the host's physiology. Variation in host habits produces life cycles of the parasite of several different durations.

The effect of temperature on eye color in Habrobracon juglandis (Ashmead), L. T. DAVID. ([Conn.] Storrs Expt. Sta. et al.). (*Amer. Nat., 72 (1938), No. 743, pp. 574–577*).

Notes on Apanteles congregatus (Say) as a parasite of tobacco hornworms, J. U. GILMORE. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 6, pp. 712–715, fig. 1*).—Observations of the biology and natural enemies of *A. congregatus*, a common parasite of certain sphingid larvae in the eastern half of the United States, Brazil, Canada, and Jamaica, and of which the tomato worm is the preferred host, are reported.

Laboratory studies on Tetrastichus xanthomelaenae Rond. and Tetrastichus sp., two hymenopterous egg parasites of the elm leaf beetle, P. A. Berry. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *57* (*1938*), *No. 11* *pp. 859–863, fig. 1*).—In the course of attempts to establish the egg parasite *T. xanthomelaenae* of the elm leaf beetle in the United States, another, unidentified, species of the genus was discovered in imported material. In the studies conducted the development was found to be similar in the two species, except that the life cycle of the unidentified species was slightly longer than that of *T. xanthomelaenae*. "When superparasitism or multiple parasitism occurred, all but one larva in each host egg died in the early instars. Where the host was attacked by both species, the one attacking first had the better chance of surviving. Both species are therefore primary parasites. The eggs and young larvae of the two parasites have definite characters by which they can be readily separated, but no distinguishing characters were found for the later instars of the pupae. In all importations the percentages of adult *Tetrastichus* sp. emerging from the beetle eggs were low, never exceeding 5 percent."

On the production of "sterile" eggs in Habrobracon, E. M. Spotkov (*Amer. Nat.*, *72* (*1938*), *No. 743*, *pp. 577, 578*).

Thelyotokous parthenogenesis in Cephus cinctus Nort.: A criticism, S. G. Smith (*Canad. Ent.*, *70* (*1938*), *No. 12*, *pp. 259, 260*).—A critical discussion of the contribution by Farstad previously noted (E. S. R., 80, p. 377).

ANIMAL PRODUCTION

Vital energetics: A study in comparative basal metabolism, F. G. Benedict (*Carnegie Inst. Wash. Pub. 503* (*1938*), *pp. VII+215, figs. 46*).—Following a discussion of the physical and technical conditions necessary for comparable measurements of heat production and the bases for presenting metabolism data, the results of a survey of the basal metabolism data for numerous species of mammals and birds are summarized. The interspecific comparisons of true basal metabolism of warm-blooded animals, a comparison of warm-blooded and cold-blooded animals, and factors that may contribute to metabolic differences within and between species are discussed at length.

[Animal production and poultry studies in the Southern States] (*Assoc. South. Agr. Workers Proc.*, *39* (*1938*), *pp. 10, 11, 22–27, 28, 29, 31–34, 70, 71, 125–127, 129, 130*).—The following papers were presented at Atlanta, Ga., February 2–4, 1938 (E. S. R., 78, p. 518): Mineral Deficiencies of the Soil in Relation to Animal Nutrition, by L. G. Willis (Univ. N. C.); Calcium and Phosphorus in Livestock Nutrition, by M. G. Snell (La. State Univ.); Mineral Supplements for Cattle, by R. B. Becker (Univ. Fla.); on the utilization of roughages by Beef Cattle, by J. M. Jones (Tex. Expt. Sta.), Dairy Cattle, by R. B. Becker (Fla.), Workstock, by R. H. Means (Miss. State Col.), Swine, by E. H. Hostetler (Univ. N. C.); and Sheep, by C. C. Flanery (Univ. Tenn.); The Production of Corn or Substitutes for Corn To Meet Livestock Requirements in the South, by E. W. Sheets (Miss. State Col.); Report on the Fourth International Grasslands Congress of 1937, by R. H. Lush (La.); Cottonseed Meal as a Southern Resource, by A. L. Ward; Vitamin Content of Roughages, by O. C. Copeland (Tex.); The Preservation of Nutrients in Roughage, by G. H. Wise; Special Barn Curing of Roughages, by C. E. Wylie and J. W. Weaver, Jr. (Univ. Tenn. et al.); Feed Requirements and Methods of Raising Workstock, by R. H. Means (Miss. State Col.); The Relationship Between Age at Sexual Maturity and Mortality of Pullets During the First Laying Year, by C. L. Morgan (Clemson

Agr. Col.); Poultry Nutrition Investigations at Beltsville, by H. W. Titus (U. S. D. A.); Facts and Fancies About Coccidiosis, by D. C. Broughton (Univ. Ga.); Some Observations on Poultry Grit, by J. C. Fritz; and [The Importance of Lactoflavine in Poultry Rations], by L. Novins.

[Animal husbandry research at the Georgia College of Agriculture] (*Ga. Univ. Bul. 708* (*1938*), *pp. 35–40, 56–65, figs. 6*).—Results are briefly noted on the feed requirements for wintering brood mares and their live weight trends during the wintering period, by M. P. Jarnagin; a comparison of native, Corriedale, Southdown, and Hampshire blood lines for spring lamb production, by W. S. Rice; the use of peanut meal in chick starting and laying rations, the value of dried skim milk in chick starting rations, dietary control and deep-litter control of cecal coccidiosis, and a summary of 11 years' records in the Georgia egg-laying contest, all by F. E. Mitchell, J. A. Bell, D. C. Boughton, and W. B. Forney.

Seasonal composition and yields of pastures, R. H. LUSH (*Louisiana Sta. Bul. 299* (*1938*), *pp. 24*).—The results of a large number of yield and composition determinations for pasture grasses produced on alluvial and benchland soils over a period of 8 yr. are summarized. Two years' results indicated that the application of commercial nitrogen and phosphorus had little effect on yield or composition of the grasses grown on these soil types, and all later results were on unfertilized pastures. An 8-yr. average of nearly 40,000 lb. of green yield, equivalent to over 5,000 lb. of total digestible nutrients per acre, is indicated for these pastures.

A study of seasonal trends in composition when the pastures were clipped at 30-day intervals showed that highest dry-matter yields were obtained in April and August, while the nutritive value per 100 lb. of grass was highest in midsummer. Crude protein, moisture, calcium, and to a lesser extent fat and phosphorus contents decreased with advancing season, while the crude fiber steadily increased from spring to fall. Areas clipped at 60-day intervals yielded 36.7 percent more digestible nutrients and 20.8 percent more crude protein than comparable areas clipped at 30-day intervals. Fresh pasture areas averaged 41.5 percent more dry matter than areas which had been constantly clipped and protected from additions of manure for 5 yr. The distribution of rainfall, maximum and minimum temperatures, shading, and intervals of cuttings were important factors in determining the yield and composition of these pastures.

Cottonseed meal: Origin, history, research, R. S. CURTIS (*Raleigh, N. C.: Robert S. Curtis Pub. Co., 1938, pp. XXXII+513, figs.* [*164*]).—This treatise presents historical and technical data, with the primary objective of bringing about a better understanding of the problems involved in using cottonseed meal as a livestock feed.

Studies of the factor in cod-liver oil concerned in the production of muscle dystrophy in certain Herbivora, G. DAVIS, L. A. MAYNARD, and C. M. MCCAY ([*New York*] *Cornell Sta. Mem. 217* (*1938*), *pp. 28, pls. 2, figs. 3*).—Continuing this line of investigation (E. S. R., 79, p. 530), approximately 250 guinea pigs were fed both natural and synthetic rations supplemented with cod-liver oil or concentrates prepared from the oil, the oil being fed at the rate of 0.5 g per animal daily and the concentrate on a vitamin-equivalent basis. No cases of muscular dystrophy occurred in animals fed natural diets, while the addition of cod-liver oil or its concentrates produced gross or microscopic lesions in about 20 percent of the cases. A synthetic diet, in which vitamins A and D were supplied by carotene and irradiated yeast, respectively, supported approximately normal growth with no evidence of dystrophy, but when the vitamins were supplied by a cod-liver oil concentrate muscular dystrophy resulted. The inclusion of cottonseed oil in the diet exerted a protective action against this disorder. In one experiment, a natural diet supplemented with cod-liver oil concentrate dissolved in cottonseed oil failed to produce dystrophy during prolonged feeding, whereas feeding the concentrate dispersed in water resulted in lesions in a high percentage of cases. It was demonstrated that neither arsenic nor cholesterol, present in cod-liver oil, was concerned in the production of dystrophy, and the specific factor or property was not identified.

The digestibility of carotene by rats and chickens, A. R. Kemmerer and G. S. Fraps. (Tex. Expt. Sta.). (*Jour. Nutr., 16 (1938), No. 4, pp. 309–315, fig. 1*).—Based on the difference in the amount of spectrographically determined carotene ingested by rats and chickens and that appearing in their excreta, the apparent digestibility of carotene was determined when different sources and levels of carotene were fed. Yellow pigments were found in the excreta of these animals when they received a practically carotene-free diet, and correction was made for these pigments in estimating the digestibility of carotene. Carotene was supplied in dehydrated alfalfa leaf meal at levels of 20 p. p. m. and 1 p. p. m. At the former level, rats digested 18 to 23 percent and chickens 29 percent and at the latter level rats digested 43 percent and chicks 69 percent. When 10.5 p. p. m of carotene in Wesson oil was fed to rats 51 percent was digested, as compared with 22 percent when an equal amount of carotene was supplied in dehydrated alfalfa leaf meal.

The vitamins of the B–G complex, D. Miller. (U. S. D. A.). *Poultry Sci., 17 (1938), No. 6, pp. 523–539*).—A comprehensive review of the field, in which an effort has been made to coordinate the nomenclature used by the various investigators in designating the several components of the vitamin B–G complex and to present the more recent findings regarding these components, especially those concerning the interrelationship between the components and the oxidative enzymes. A bibliography of 114 references is included.

Biological assay of milk with lactoflavin as a standard for vitamin G, B. L. Kunerth, M. M. Kramer, R. M. Dickman, and C. H. Whitnah. (Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans., 40 (1937), pp. 297–299, fig. 1*).—As measured by the growth response of rats, samples of Jersey milk and Holstein milk collected in September after a prolonged drought period each contained approximately 2γ of flavin per gram, while comparable samples collected in December after a period of good fall pasture each contained about 2.7γ per gram. Winter-produced mixed herd milk and milk from Holstein cows on experiment without access to green feed each contained about 2γ per gram.

Further observations on reproduction in guinea pigs fed vitamin C at different levels, M. T. Harman and I. Gillum. (Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans., 40 (1937), pp. 369–376, fig. 1*).—The Sherman-LaMer-Campbell vitamin C-free diet was employed as a basal ration. Negative-control guinea pigs failed to grow or reproduce and soon died, young animals proving most susceptible. Young guinea pigs grew and maintained a healthy appearance better than older animals when orange juice was supplied as a source of vitamin C. The feeding of orange juice at levels ranging from 5 cc per 300 g of body weight to ad libitum consumption was not a sufficient supplement to the basal diet for reproduction and birth of living, healthy full-term young. When greens were fed as the supplement to the basal diet, normal growth and reproduction were secured.

Properties of the antihemorrhagic vitamin (vitamin K), A. A. KLOSE, H. J. ALMQUIST, and E. MECCHI. (Univ. Calif.). (*Jour. Biol. Chem., 125 (1938), No. 2, pp. 681–686*).—Continuing this study (E. S. R., 78, p. 156), the effects of various chemical reagents on vitamin K have been determined. The activity of the vitamin was destroyed by oxidizing agents, strong acids, aluminum chloride, and certain other reagents which have the ability to add across an ethylenic linkage. Its activity was not appreciably affected by reducing agents or by reagents which react with alcoholic, carbonyl, or phenolic groups.

Further observations on the production of cobalt polycythaemia in rats, S. W. JOSLAND and K. J. MCNAUGHT (*New Zeal. Jour. Sci. and Technol., 19 (1938), No. 9, pp. 536–540, figs. 2*).—Continuing these studies (E. S. R., 77, p. 675), when the cobalt supplement of rats was limited to 1 mg per head daily only one of eight individuals developed a persistent polycythemia, and with the exception of this one individual no loss in weight occurred among the cobalt-fed rats. In previous trials 1 percent of cobalt in the diet produced an intense polycythemia and loss of weight within 7 weeks. Additional evidence was obtained that storage of cobalt occurs particularly in the liver, spleen, and kidneys when cobalt supplements are fed.

Dietary magnesium and urinary calculi, I. J. and M. M. CUNNINGHAM (*New Zeal. Jour. Sci. and Technol., 19 (1938), No. 9, pp. 529–535*).—When rats were fed diets high in calcium carbonate but low in magnesium a high percentage of them developed bladder calculi, accompanied by relatively high serum calcium, alkaline urine, and a high concentration of calcium in the urine. The addition of either magnesium or phosphorus to the high calcium diet prevented the formation of such calculi.

Rearing foals and lambs by the use of colostrum, blood serum, and substitute milks, J. A. GAMBLE, I. P. EARLE, and P. E. HOWE (*U. S. Dept. Agr., Tech. Bul. 661 (1938), pp. 35, fig. 1*).—In studies with 13 newborn foals, three fed only a mixture of dried whole cow's milk, dried skim milk, sugar, and water, all developed symptoms commonly associated with joint ill and died within 2 weeks after birth, while seven foals similarly fed, except that 1,000 cc or more of normal horse serum was included in the mixture during the first 18 hr., remained healthy and grew well. A study of the change in protein fractions of the blood serum of these foals indicated that the ingestion of this amount of horse serum caused an increase in serum globulins similar to those receiving colostrum, while no increase in serum globulin occurred when only the dried milk mixture was fed. Six foals which received the serum continued to thrive and grew at approximately a normal rate when fed the dried milk mixture to 24 weeks of age.

In studies with 68 newborn lambs, fresh sheep's milk, fresh goat's milk, mixtures of dried cow's milk, cow's colostrum, and sheep serum incorporated in dried cow's milk mixtures were fed as substitutes for sheep colostrum. It was definitely shown that lambs required sheep's colostrum or a suitable substitute, and the sheep serum incorporated in the dried milk mixture was most effective of the substitutes tested. Cow's colostrum was an unsatisfactory substitute, resulting in marked kidney damage, and a study of the serum protein fractions in lambs thus affected indicated a gross absorption of foreign protein from the cow's colostrum ingested. Lambs which were allowed to suckle colostrum from their dams made excellent growth when fed a mixture of dried whole cow's milk and water, but lambs fed dried skim milk mixture either with or without vitamin and mineral supplements either died or survived as sickly lambs suffering from frequent diarrhea.

Nutritional physiology of the adult ruminant, E. G. Ritzman and F. G. Benedict. (N. H. Expt. Sta.). (*Carnegie Inst. Wash. Pub. 494 (1938), pp. VI+200, pls. 3, figs. 3*).—This monograph summarizes the results obtained in extensive researches conducted cooperatively by the nutrition laboratory of the Carnegie Institution of Washington. The first section of the report describes the animals used and the technics employed in these studies and discusses the physiology of digestion, absorption, and elimination of waste. The principal topics of discussion under this are products by the ruminant, the waste products of digestion, factors that affect the digestion and absorption of food nutrients, and the waste products of metabolism during feeding and fasting. The second section presents the results of research on the energy metabolism of ruminants, including the many factors involved in basal metabolism and the stimulating effect of ingested food. The third section deals with the evaluation of feeds, in which are discussed the proteins, factors to be considered in evaluating the utilization of energy by cattle, differences in the physiological uses of available energy of feeds and their relation to the definition of net energy, and the limitations in the present bases of expressing nutritive values.

Market classes and grades of feeder and stocker cattle, W. O. Fraser and D. J. Slater (*U. S. Dept. Agr. Circ. 505 (1938), pp. 19, figs. 6*).—Definitions of terms and classifications for feeder and stocker cattle, and standards for grades of feeder and stocker steers, heifers, and cows, along with illustrations of steer grades, are presented. This supplements Bulletin 1464 (E. S. R., 57, p. 170).

Corn of different degrees of hardness for pigs, C. C. Culbertson, A. L. Anderson, J. L. Robinson, and W. E. Hammond (*Iowa Sta. Bul. 375 (1938), pp. 249–271, figs. 2*).—Three feeding trials were conducted to determine the rate and economy of gain for fattening pigs receiving shelled corn of three degrees of hardness. The corns compared were (1) a special selection of Reid Yellow Dent (soft), (2) elevator-run Reid Yellow Dent (medium), and (3) Krug (hard). The average of two trials showed that it required pressures of 27.8, 30.3, and 37.1 lb. to crush samples of these respective varieties. The corn was self-fed in all trials, while in some instances the protein-mineral supplement was self-fed and in others hand-fed. The three types of corn were of approximately the same chemical composition and were consumed with equal relish. The hardness of the corn had no appreciable effect on the amount of grain consumed daily per pig or the rate of gain, indicating that the hard type of corn was masticated and digested as well as the softer types.

The vitamin-B complex as related to growth and metabolism in the pig, E. H. Hughes (*Hilgardia* [*California Sta.*], *11 (1938), No. 10, pp. 593–612, figs. 5*).—Trials with 11 lots of pigs are reported in which a basal diet of brewers' rice or rice screenings, purified casein, salt mixture, and cod-liver oil was variously supplemented with members of the vitamin B complex or natural feeds rich in the vitamin B complex.

Pigs on the basal diet made poor growth and developed a condition similar to pellagra in humans. The addition of nicotinic acid to the diet in the presence of riboflavin and thiamin fully protected pigs of similar weight and age against this syndrome. In addition to the impaired growth, anorexia, impaired locomotion, and lowering of body temperature and respiratory rate were caused by diets deficient in one or more of the members of the vitamin B complex. An autopsy of these animals revealed flabby hearts, stomachs full of feed with some gastritis, a catarrhal exudate in the small intestines, and occasionally ulcers in the large intestines. Additions of untreated yeast, whey powder, or skim milk powder to the basal diet produced less rapid growth than the basal diet plus thiamin, riboflavin, nicotinic acid, and the filtrate factor. The addition of riboflavin to the basal diet resulted in improved appetites and more rapid and more economical gains The addition of the filtrate factor in the presence of thiamin, riboflavin, and nicotinic acid improved the rate of growth.

Some observations on the normal variations in composition of Light Sussex cockerels, E. T. Halnan (*Jour. Agr. Sci. [England], 28 (1938), No. 3, pp. 379–392, figs. 6*).—Studies at the Animal Nutrition Institute, Cambridge, on the body composition of Light Sussex cockerels 22 weeks of age showed a highly negative correlation between fat percentage and moisture percentage of the carcass, a definitely positive correlation between fat content of the bones and that of the flesh and offal, also between the ash content of the bones and that of the flesh and offal, and a rather constant protein and ash ratio for all individuals over 7 weeks of age. The fat content of individuals varied greatly, suggesting that live weight increase is unreliable as a measure of total energy stored. The caloric content per 100 g of live weight ranged from 115 to 189,, with an average of 153.25 and a coefficient of variation of ±11.42 percent.

Observations on the mineral metabolism of pullets, III, R. H. Common (*Jour. Agr. Sci. [England], 28 (1938), No. 3, pp. 347–366, figs. 5*).—Continuing this series of studies (E. S. R., 76, p. 88), two groups of White Leghorn pullets approaching laying age, one on a high calcium diet and the other on a low calcium diet, were used in this experiment which combined daily calcium and phosphorus balances and carcass analyses. One-half of each group was sacrificed for analysis immediately after the first egg was laid, while the remaining half on the low calcium intake was sacrificed after eggs became very thin shelled and the remainder on the high calcium diet after from 17 to 19 eggs had been laid and the birds were still in full lay.

The fat contents of the carcasses of both lots on low calcium intake were considerably higher than for those individuals on the high calcium intake. The calcium oxide content of the pullets was materially increased by the short period of high calcium feeding before the onset of laying. The relative proportion of calcium, phosphorus, magnesium, and carbonates in the skeletal tissues indicated that the composition of the inorganic constituents of the skeleton may be rapidly modified by alterations in the mineral metabolism due to egg production with and without calcium carbonate supplements. Apparently about one-fourth of the body stores of calcium may be removed for eggshell formation.

Composition of the uterine secretion of the domestic fowl, B. W. Beadle, R. M. Conrad, and H. M. Scott. (Kans. Expt. Sta.). (*Poultry Sci., 17 (1938), No. 6, pp. 498-504*).- -About 50 samples of the uterine secretion of actively laying hens were obtained either by catheterization of normal hens or by surgery from anesthetized birds. Analyses of these samples revealed that this secretion was essentially a mineral solution consisting mainly of sodium, calcium, and potassium present as chlorides and bicarbonates. The small amount of protein present was apparently due to diffusion from the formed egg. A comparison of the analysis of 35 uterine eggs with that of 35 laid eggs from the same hens indicated that the principal additions to the egg during the formation of the outer thin white were water, potassium, and bicarbonate ions with smaller amounts of sodium and chloride ions. The potassium concentration of the uterine solution was approximately 10 times that of normal blood serum. The possible significance of this phenomenon is discussed.

The formation of the egg of the domestic fowl, R. M. Conrad and H. M. Scott. (Kans. Expt. Sta.). (*Physiol. Rev., 18 (1938), No. 4, pp. 481–494*).—A comprehensive review, including formation of the ovum, the mechanism of ovulation, and formation of egg white, shell membranes, and shell. Sixty-five references to the literature are cited.

Early identification of fertility in hens' eggs, M. W. Olsen and C. W. Knox. (U. S. D. A.). (*Poultry Sci., 17 (1938), No. 6, pp. 472–477*).—Using a single-hole commercial candling machine equipped with a 75-w clear glass light bulb and both the yellow and blue-green glass light filters, both brown-shelled and white-shelled eggs were candled at 2-hr. intervals up to 20 hr. for those incubated at 100° F. and up to 30 hr. for those incubated at 90°. The most practical time to detect fertility was found to be from 16 to 20 hr. at the former incubation temperature (approximately 93 percent accuracy) and at 30 hr. at the latter temperature (about 94 percent accuracy with white and 72 percent accuracy with brown eggs). When a 75-w daylight bulb was used in the candling machine and the operator was fitted with dark blue glasses practically as good results were obtained as when the blue or blue-green glass filters were used.

The vitamin D content of certain egg and egg oil products, R. Reder. (Okla. Expt. Sta.). (*Poultry Sci., 17 (1938), No. 6, pp. 521, 522*).—Bio-assay of the vitamin D content of nonirradiated dried whole egg, egg oil, and the unsaponifiable matter of egg oil revealed potencies of 2.2, 3.3, and 16.6 International Units per gram, respectively. Irradiation of these substances increased the vitamin D potencies 15, 10, and 50 times, respectively. A fortified egg oil consisting of 93.5 percent of irradiated egg oil and 6.5 percent of irradiated unsaponifiable matter had a vitamin D potency of 95 units per gram, equivalent to that in standard cod-liver oil.

Mortality in poultry flocks and the vitamin A content of the livers of pullets and hens, D. F. Chichester, W. C. Russell, and C. B. Hudson. (N. J. Expt. Stas.). (*Poultry Sci., 17 (1938), No. 6, pp. 505–510, fig. 1*).—A comparison of the vitamin A content of the livers of 154 chickens submitted to this laboratory for autopsy (deaths mostly from disease) and of 69 normal chickens killed by bleeding revealed that 46.7 percent of the former and 45 percent of the latter contained less than 100 Moore units of vitamin A per gram of liver, while 15.6 and 23.1 percent contained from 100 to 200 units, 9.8 and 14.5 percent from 200 to 300 units, 6.5 and 8.7 percent from 300 to 400 units, and 21.4 and 8.7 percent over 400 units per gram, respectively. No significant relationship could be established between the vitamin A content of the livers of birds dying from specific diseases and the causative agent, the mode of transmission, or the physiological system involved. It appeared that individual chickens vary greatly in the manner in which vitamin A is utilized and stored. and that low liver vitamin A does not necessarily indicate an inadequate consumption of this factor.

The ascorbic acid content of chick blood, A. D. Holmes, F. Tripp, and G. H. Satterfield. (Univ. N. C. et al.). (*Jour. Nutr., 16 (1938), No. 5, pp. 407–416, fig. 1*).—The methods employed in determining the ascorbic acid content of blood plasma and in the chick rations are described. The feed consumption and growth data of experimental chicks are graphically presented. The ascorbic acid content of the blood plasma of these rapidly growing chicks averaged 2.039 mg percent (range 1.562 to 2.234) at 8 weeks of age and 2.054 mg percent (range 1.462 to 2.425) at 12 weeks of age. No consistent sex differences in ascorbic acid blood plasma values could be established.

The effect of riboflavin and the filtrate factor on egg production and hatchability, S. Lepkovsky, L. W. Taylor, T. H. Jukes, and H. J. Almquist (*Hilgardia [California Sta.], 11 (1938), No. 10, pp. 559–591, figs. 5*).—Three types of basal rations were employed in these studies, one a typical practical diet supposedly complete in all nutritional essentials, the second similar to No. 1 except that the usual practical sources of vitamin G were omitted, and the third a simplified diet consisting mainly of polished rice, extracted fish meal, and soybean oil designed to be very deficient in riboflavin and the filtrate factor.

The addition of riboflavin materially improved the rate of winter egg production and hatchability of the eggs with the second and third type rations and to a lesser extent with the first ration, indicating the primary importance of this factor in the ration of breeding hens and suggesting that some practical rations may not contain enough of this factor for maximum egg production and hatchability. The effect of the riboflavin supplement on the mortality of hens was variable and of doubtful significance. Riboflavin deficiency was associated with an increased fat content in the livers and by the lack of a pronounced greenish-yellow color in the egg albumin. The addition of the filtrate factor to these basal diets had no significant influence on egg production, hatchability, or mortality of hens but was essential in producing chicks resistant to a specific dermatitis. The riboflavin and filtrate factor content of eggs was directly influenced by the hen's diet. Further studies with a polished rice diet indicated the essential nature of an unidentified factor for maximum production and hatchability of eggs. When this unknown factor was inadequately supplied, the balance between it and riboflavin apparently was destroyed so that the presence of riboflavin was harmful.

The histopathology of neuromalacia and "curled toe" paralysis in the chick fed low riboflavin diets, P. H. Phillips and R. W. Engel. (Wis. Expt. Sta.). (*Jour. Nutr., 16 (1938), No. 5, pp. 451–463, figs. 8*).—Chicks fed a low riboflavin basal diet consistently developed nutritional deficiency symptoms expressed either as a rapidly acute paralysis characterized as neuromalacia or a more slowly developing form which caused curled toe paralysis. Supplementing the basal diet with riboflavin prevented the occurrence of this disorder. Histological study of the nervous system of "deficient" chicks revealed a specific neuropathology of the main peripheral nerve trunks. In acute form, hypertrophy and changed appearance were apparent on gross inspection. Degenerative changes appeared in the myelin of the nerves, accompanied by Schwann cell proliferation and axis cylinder swelling and fragmentation. Histological changes also occurred in the spinal cord. Neuromuscular end plate degeneration and muscle fiber degeneration frequently accompanied the paralysis. Adding 300 μg of riboflavin per 100 g of basal ration or 6 percent of artificially dried young oatgrass supplied a marginal level of flavin, generally preventing gross symptoms of the disease, while 400 μg of riboflavin per 100 g of ration gave complete protection. The addition of the antidermatitis factor to this basal diet consistently reduced the histopathology of the spinal cord, indicating that this ration was low or marginal in this factor.

Neuromalacia associated with low riboflavin diets: A preliminary report, P. H. Phillips and R. W. Engel. (Wis. Expt. Sta.). (*Poultry Sci., 17 (1938), No. 6, pp. 463–465, fig. 1*).—A preliminary report of the research described above.

Some observations on the chick antidermatitis factor, D. W. Woolley, H. A. Waisman, O. Mickelsen, and C. A. Elvehjem. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 125 (1938), No. 2, pp. 715–721*).—Continuing this study (E. S. R., 78, p. 575), considerable concentration and purification of the chick antidermatitis factor was achieved by solvent fractionation, adsorption on activated charcoal, acetylation, and molecular distillation. It is apparently acidic in nature and contains one or more hydroxyl or amino groups. It is soluble in ethyl acetate, dioxane, glacial acetic acid, and other solvents previously reported. The acetyl derivative can be distilled at 100° [C.] at a pressure of approximately 10^{-5} mm of mercury. Other chemical properties are described.

Phosphorus metabolism of chicks afflicted with perosis, A. C. Wiese, B. C. Johnson, C. A. Elvehjem, and E. B. Hart. (Univ. Wis.). (*Science, 88 (1938), No. 2286, pp. 383, 384*).—A study of the phosphorus distribution in chicks suffering from perosis and of normal chicks fed the same perosis-producing diet but protected by the feeding or injection of manganese showed that (1) the inorganic phosphorus of the blood remained constant at from 4.7 to 5.6 mg per 100 cc of blood for both groups, (2) the ester phosphorus was from 26 to 30 mg per 100 cc of blood for perosis chicks and from 32 to 44 mg for normal chicks, (3) the phosphorus content of the blood was 2.1 to 3.1 units per 100 cc of blood and from 3.6 to 7.7 units per gram of green bone for chicks on the perosis-producing diet and from 15.9 to 51.3 units per 100 cc of blood and from 8.5 to 10 units per gram of green bone for chicks on the fortified diet. It is suggested that inositol may be concerned in the ester phosphorus increase in normal birds. In this connection chicks receiving the basal diet fortified with 20 p. p. m. of manganese and injected with 100 mg of inositol per week were fully protected against perosis, while chicks similarly fed but receiving only 10 mg of inositol or 100 mg of glucose per week were not protected.

The cannibalism preventing properties of oat hulls, M. W. Miller and G. E. Bearse. (Wash. Expt. Sta.). (*Poultry Sci., 17 (1938), No. 6, pp. 466–471, fig. 1*).—In a further report of this study (E. S. R., 78, p. 524), eight types of rations were compared, duplicate lots of White Leghorn pullets receiving each ration from 2 to 32 weeks of age. Birds fed a yellow corn basal ration developed cannibalistic habits which persisted throughout the experimental period. Supplements of oat ash, oat hull ash, or manganese sulfate to the corn ration were of no value in preventing feather picking. When 15 percent of spruce dust was added to the corn ration, the birds developed feather picking at about 14 weeks of age, but the condition had largely disappeared at 32 weeks of age. When the corn ration was supplemented with either oat hulls or oat mill feed or when oats replaced corn in the basal diet practically no cannibalism appeared. These data indicate that oat hulls contained the factor preventing cannibalism, although the exact nature of this factor was not determined in this study.

Turkey feeding experiments, T. H. Jukes. (Univ. Calif.). (*Calif. Turkey News, 1938, Aug., pp. 5, 6*).—A comparison was made of three types of finishing mashes for fattening turkeys from 18 to 30 weeks of age. One contained 32 percent of protein and the other two 20 percent of protein, with one of the latter containing 3 percent of dehydrated molasses and the other none. Each was supplemented with whole scratch grains (wheat 40-barley 60). All rations produced satisfactory gains, the average gain in 12 weeks ranging from 9.5 to 10 lb. for males and approximately 5 lb. for females. The consumption of scratch grain was relatively much higher with the high protein mash so that the protein content of the total feed consumed was 18.2 as compared with approximately 16 percent on the lower protein mashes. The feed required per unit of gain and feed cost per pound of gain was very similar for the three rations.

DAIRY FARMING—DAIRYING

Elements of dairying, T. M. Olson (*New York: Macmillan Co., 1938, pp. XVII+570, [figs. 88]*).—The material included in this volume is presented as a survey of the dairy industry, indicating its extent and importance, and is intended to be used as an introduction and not as an exhaustive treatment of the subject matter of any important phase of the industry. It contains 34 chapters, arranged in 6 parts as follows: (1) The dairy industry, (2) dairy cattle, (3) milk, (4) the processing industries, (5) feeding dairy cattle, and (6) dairy herd management.

Report of the Chief of the Bureau of Dairy Industry, 1938, O. E. REED (*U. S. Dept. Agr., Bur. Dairy Indus. Rpt., 1938, pp. 37*).—Dairy cattle investigations at the Beltsville, Md., and field experiment stations for which results are noted include breeding for higher milk and butterfat production in purebred dairy cattle, the relation of conformation and anatomy to producing capacity, the performance of individual quarters of the udder, input as related to output in milk production, the improvement and utilization of pastures, improved methods for ensiling grasses and legumes, a comparison of alfalfa hays harvested at different stages of maturity, skim milk feeding as related to breeding efficiency of dairy heifers, rations for wintering dairy heifers, and the use of pastures and roughages as sole rations for milking cows.

Nutrition studies noted include the carotene requirements for the production of normal calves, the value of carrots as a supplement to poor-quality hay, low-calcium hay supplemented with vitamins A and D as sources of calcium for heifers, raising calves on skim milk and poor-quality hay, the carotene content of roughages, the relation of roughages to muscular dystrophy in rabbits, and other nutrition tests with small animals. Errors in the spectrophotometric determination of vitamin A in butterfat, methods for the fractionation of fats, and the preparation and chemical properties of androgenic hormones have also been studied.

Investigations with dairy products as reported include numerous phases on the chemistry and bacteriology of milk; various factors relating to the manufacture of butter, cheese, and ice cream; the production of casein fiber; the production of various byproducts from whey; new uses for concentrated sweetened whey; new methods for packaging and merchandizing cheese; the effect of various plant operations on the quality of market cream; the relation of curd tension to digestion of milk; and the significance of the chloride content of milk in relation to udder infection. Other studies relate to corrosion of metals by chlorine solutions and the dissipation of chlorine in washing solutions by dirt on cows' udders.

[Progress of dairy research in Scotland] (*Hannah Dairy Res. Inst., Ann. Rpt., 9 (1938), pp. 27, pls. 4*).—This report of research in progress (E. S. R., 78, p. 687) includes information on the protein requirements of dairy cows, the importance of home-produced feeding stuffs, the production of artificially dried grass, the biochemistry of milk secretion, the influence of inadequate ventilation on yield and quality of milk, the genetics of dairy cattle, crop and stock husbandry, contagious bovine abortion, bovine mastitis, bovine tuberculosis, the bacteriological control of milk, factors affecting the heat resistance of micro-organisms, and the bacteriology, keeping quality, and solubility of milk powders.

Palatability of soybean meals for dairy cows, C. F. MONROE and C. C. HAYDEN (*Ohio Sta. Bimo. Bul. 195 (1938), pp. 209–214, fig. 1*).—Expeller, hydraulic, and extracted soybean meals were offered free-choice to cows, both as straight supplements and in feed mixtures. There was no marked difference in perference for the different meals fed in the grain mixtures, while as a straight supplement preference was shown for the expeller meal. In one trial in which extracted heat-treated meal was included in the feed mixtures it ran a poor third to expeller and extracted meals. However, the same mixture was readily consumed in satisfactory quantities when fed to the same animals as the only grain ration.

The value of grass extract and of dried extracted grass in the winter ration of the dairy cow, with special reference to their effects on the carotene content of the milk, F. E. Moon, J. H. Faulder, and B. Thomas (*Jour. Soc. Chem. Indus., Trans., 56 (1937), Dec., pp. 468T–471T*).—This report from King's College (University of Durham) briefly describes a method for extracting fresh grass, in which the grass is passed through a hot bath of juice obtained from previous extractions and then through crushing rollers. The juice is concentrated to a sirupy consistency for distribution, and the extracted grass is artificially dehydrated and baled for feed purposes. A reversal feeding trial with Milking Shorthorn cows indicated that inclusion of the grass juice, the extracted dried grass, or both in the ration has no significant influence on the level of milk and butterfat production. Addition of the extracted grass to the ration significantly increased the carotene content of the milk, while grass extract was ineffective in this respect. The extracted dried grass appeared equal to naturally dried young grass in feeding value.

The rearing of calves from birth without whole milk, J. and J. E. Archer, J. R. Bond, and G. Dunlop (*Scot. Jour. Agr., 21 (1938), No. 3, pp. 259–267, pl. 1, figs. 2*).—In two series of experiments, dairy calves were removed from their dams at from 2 to 4 days of age and were fed fresh skim milk or reconstituted skim milk supplemented with 1 tablespoonful of cod-liver oil daily and with access to a dry concentrate mixture and good-quality hay after 1 week of age. The age at which calves were weaned from skim milk ranged from 9 weeks to 4 mo. All calves grew at approximately a normal rate and remained in excellent health through the course of these experiments. A substantial saving in cost resulted from raising calves by this method as compared to the normal procedure.

Effectiveness of ultraviolet light applied to the head or back regions of calves, W. E. Krauss and C. E. Knoop. (Ohio Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 11, pp. 705–711*).—Growing dairy calves fed a rickets-producing diet and exposed to ultraviolet irradiation from artificial sources of sufficient intensity to approximately equal the radiation received from 2 hr. of midsummer sunshine were protected against rickets, while control calves developed pronounced rachitic symptoms. Applying the ultraviolet light to the region back of the withers was almost as effective as when an equivalent amount was applied to the head region of the calves.

Studies on the composition of bovine blood.—I, The magnesium content of the blood plasma of the normal dairy calf, C. W. Duncan, C. C. Lightfoot, and C. F. Huffman. (Mich. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 11, pp. 689–696, figs. 2*).—Based on the determination of blood plasma magnesium for 107 normal dairy calves from birth to 18 mo. of age, the mean value of 2,286 determinations was 2.414 mg per 100 cc of plasma (range 1.02–3.83 mg), with 79.7 percent falling within the range of 1.895–2.795 mg. There was a definite tendency for the values to increase up to 12 or 13 mo. of age, accompanied by a series of rhythmic variations extending over several months. These data indicate the normal range and suggest that fluctuations in the plasma magnesium content of the blood of growing dairy calves are to be expected as normal occurrences.

Nature of the swelling in the udder of a cow at calving time, W. W. Swett, C. A. Matthews, and R. R. Graves. (U. S. D. A.). (*Jour. Dairy Sci., 21 (1938), No. 11, pp. 713–723, figs. 5*).—This report describes the case of a Holstein cow which consistently developed an extensive amount of swelling in the udder and abdomen region at calving time, with a tendency for the udder swelling to persist for several months during lactation. A detailed study of the amputated udder showed that this intense swelling was edematous in nature, and that it did not invade or affect the secreting tissue to any appreciable extent but was confined chiefly to the space between the glandular tissue and the skin.

A study of the proteins of the inactive and active mammary gland, S. M. Jackson and R. A. Gortner. (Minn. Expt. Sta.). (*Jour. Biol. Chem., 123 (1938), No. 3, pp. 719–727, fig. 1*).—The materials used in this study included mammary gland tissue from 7 animals, including 1 heifer, 2 dry cows, 1 nearly dry, and 3 lactating cows, and supramammary lymph gland tissue and muscle tissue. These tissues were more completely peptized by 10 percent sodium chloride solutions than by 0.8 percent hydrochloric acid solutions, the latter extracting a higher percentage of the protein nitrogen from the active than from the inactive glands. The sodium chloride extracts of inactive glands were higher in albumin than in globulin, while in active glands the situation was markedly reversed. The albumin: globulin ratio of the lymph gland resembled that of the active mammary gland. The nitrogen distribution of the protein fraction isolated from the glands showed no significant differences which could be correlated with glandular activity, leading to the conclusion that differences in protein tissue of the active and inactive glands are reflected in their physical properties rather than in differences in their amino acid composition.

Effect of shaking on the lipolysis of cow's milk, V. N. Krukovsky and P. F. Sharp. (Cornell Univ.). (*Jour. Dairy Sci., 21 (1938), No. 11, pp. 671–682, figs. 4*).—Samples of raw, whole cow's milk, vigorously shaken for 2 hr. at 37° C., decreased an average of 0.3 pH, while shaken pasteurized samples and raw samples held unshaken for a like period did not decrease in pH, indicating that the shaking of the raw samples while the fat was in a liquid or partially liquefied state induced lipolysis. Samples shaken at 25° showed less increase in acidity and those shaken at 2° practically no increase, indicating that temperature is a controlling factor in lipolytic activation. Lipolysis induced in this manner continued after the milk had been cooled to low temperatures. The amount of induced lipolysis bore little or no relation to breed, season, and level of production. It appeared that all milk is capable of appreciable true lipolytic activity when subjected to suitable activating treatment, while only winter-produced milk from cows in advanced lactation showed natural lipolytic activity when cooled and held for 1 or 2 days.

Studies on the keeping qualities of unpasteurized and pasteurized milk, M. R. Pascua (*Philippine Jour. Anim. Indus., 5 (1938), No. 3, pp. 309–317, pl. 1*).—A comparison of the keeping quality of raw and pasteurized milks indicated that the former remained fresh and wholesome for from 12 to 15 hr. at room temperature and for from 3 to 4 days at 40° F., while the latter remained wholesome from 20 to 24 hr. at room temperature and from 6 to 7 days at 40°. Pasteurizing raw milk 9 hr. after milking prolonged keeping quality from 4 to 6 hr. longer at room temperature than milk pasteurized 3 hr. after milking. Raw milk pasteurized from 24 to 48 hr. after being stored at 40° remained wholesome from 6 to 7 days. Boiled milk did not possess any better keeping quality than pasteurized milk. Alcohol and acidity tests when used alone did not prove to be accurate tests for measuring milk quality.

Improved methods of sampling milk and counting bacteria, R. S. Breed (*Farm Res.* [*New York State Sta.*], *5 (1939), No. 1, p. 15*).—The importance of grading market milk on the basis of its bacterial content, the shortcomings of the plate method of counting which is now generally used, the possibilities of grading by direct microscopic examination, and the desirability of improved media for making bacterial plate counts of milk are each briefly discussed.

Some experiments dealing with ropy milk, E. C. Beck and F. E. Chase (*Sci. Agr., 19* (*1938*), *No. 1, pp. 48–54, fig. 1*).—In experiments at the Ontario Agricultural College, 19 cultures of bacteria (10 species) were each inoculated into samples of raw, pasteurized, and sterilized milks and creams and incubated at temperatures of 18°, 25°, and 30° C. Three strains of *Alcaligenes viscosus* produced pronounced ropiness in the pasteurized and sterilized samples of milk at all temperatures, and 1 strain of *Aerobacter cloacae* produced typical ropiness in these milks at 25° and in sterilized milk at 30°. In no instance did ropiness develop in raw milk, indicating that acid produced through the development of lactic acid-producing bacteria retarded the growth of ropy milk organisms. *Lactobacillus casei* produced a slightly slimy curd in pasteurized and sterilized milk at 25° which might be confused with ropiness. Two of the strains of *Alcaligenes viscosus* which produced ropiness in milk also produced ropiness in pasteurized and sterilized creams. The diffusion test for detecting ropiness in milk was not affected by variations in water temperature from 4° to 37° or in milk temperature from 4° to 30°, but a water temperature of 65° proved unsatisfactory. The lack of sensitiveness limits the value of this test.

Soft curd milk, F. J. Doan. (Pa. Expt. Sta.). (*Jour. Dairy Sci., 21* (*1938*), *No. 11, pp. 739–756*).—A critical review, including 87 citations to the literature.

Practical manufacture of cultured milks and kindred products, A. D. Burke (*Milwaukee. Wis.: Olsen Pub. Co., 1938, pp. XV+195, figs. 30*).—A practical treatise on the manufacture of commercial cultured buttermilks of all types, commercial casein, cottage and cream cheese, and commercial sour cream, with information on dried, condensed, and fruit-flavored buttermilk.

Judging sweet cream, J. H. Nair and L. C. Bentham (*Jour. Dairy Sci., 21* (*1938*), *No. 12, pp. 791–799, fig. 1*).—The authors discuss the common defects of fluid cream and point out the undesirability of using a single score card interchangeably for milk and cream as now generally practiced. A separate score card for cream is proposed, which would allow 40 points for flavor, 20 for body, 15 for bacterial count, and 5 each for cream plug, serum separation, acidity, sediment, and package. A method and apparatus for determining the whipping quality of cream is also described.

Examination of butter with the Burri smear culture technic, H. F. Long and B. W. Hammer. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 12* (*1938*), *No. 4, pp. 441–450, pl. 1*).—The results of examining a large number of commercial and experimental butters by the Burri smear culture technic are presented. Approximately 1/20000-g portions of butter, smeared on the surface of a dry agar slope, were used. It was found that bacteria in various types of butter were often very irregularly distributed, both from the standpoint of numbers and colony types. In some instances colony types were found on slopes which were not evident on plates. Counts obtained by multiplying the average number of colonies per slope by 20,000 did not agree closely with plate counts and were often considerably lower, particularly in high-count samples. However, the Burri counts readily distinguished between low-count and high-count butters.

Experiments on the packing and storage of butter, I–IV, C. R. Barnicoat (*New Zeal. Jour. Sci. and Technol., 19* (*1938*), *No. 9, pp. 546–572, figs. 2*).—The results of four studies are reported.

I. *Packing of butter in cans under reduced air pressure* (pp. 546–551).—Butter packed in tins under reduced air pressure showed a slight advantage in flavor score and freedom from surface taint after 3–6 months' storage at 14° F.

as compared with normally packed samples. These advantages were not attributed to the absence of oxygen from the pack but rather to improved surface protection.

II. *Storage of butter at chilling temperatures* (pp. 552–555).—Butter stored at 32° for about 14 weeks showed only a slight loss in quality, but after 21 weeks' storage at this temperature there was a marked deterioration in quality as compared with butter in frozen storage.

III. *Factors influencing surface defects of butter* (pp. 556–562).—Butter held at relatively high temperatures, i. e., in the factory cool room or during transit, was found to be particularly susceptible to the development of surface taints. Practices which would tend to improve the quality of the butter surface are described.

IV. *Wrapping materials and their properties* (pp. 562–572).—The merits of various materials, including transparent cellulose, metal foils, metal-treated paper, waxed paper, and parchment as wrapping materials for butter have been compared. The requirements of a good butter-wrapping material are outlined. Metal foils waxed to parchment complied with these requirements in the most satisfactory manner.

Butterfat losses in buttermilk, F. H. McDowall (*New Zeal. Jour. Sci. and Technol., 19 (1938), No. 11, pp. 682–690*).—In studies at the New Zealand Dairy Research Institute a comparison of various methods for determining the butterfat content of buttermilk indicated that the butyl alcohol method gave results in close agreement with those obtained by the Roese-Gottlieb method. It was found that the estimation of the total solids content of buttermilk based on measurements of density and fat content according to the Richmond rule gave satisfactory results on the average, although liable to considerable error in individual cases. With mixed creams a presumptive value of 8.8 for solids-not-fat in the undiluted serum was not likely to cause appreciable error in the calculated values for fat losses in buttermilk. A comparison of fat losses in buttermilk for flash-pasteurized and vacreator-pasteurized creams indicated that the latter method increased fat losses an average of about 0.3 percent, probably due to a partial disruption of the fat globules in the cream.

Iowa Swiss-type cheese, E. F. Goss, V. Nielsen, and M. Mortensen (*Iowa Sta. Bul. 378 (1938), pp. 349–372, figs. 8*).—A process for the manufacture of special Swiss-type cheese is fully described. This process employed on a semicommercial scale has yielded an excellent quality of cheese, demonstrating that it is practical under Iowa conditions. Essential points in the manufacture of this type of cheese are the use of high quality milk, pasteurization, and careful control of each step in the manufacturing process. Such cheese is softer bodied, milder in flavor, and quicker curing than typical Swiss cheese. Careful control of acidity during manufacture, regulation of the lactose content, and reduction of storage temperature at the proper stage of curing are important factors in determining the amount of gas production and "eye" formation in the cheese. Manufacturing costs compared favorably with those of the usual American cheese. Suggestions are offered for the proper care of such cheeses in the home which will preserve their flavor and quality.

Use of low-lactose milk solids in ice cream, W. J. Corbett. (Univ. Ill.). (*Ice Cream Rev., 22 (1939), No. 6, pp. 34, 68, 70, 71*).—A process for the preparation of a low lactose milk solid is briefly described. Substituting this low lactose solid for a portion of the regular serum solids ordinarily used in ice cream mixes materially improved the body of the resulting ice cream. The use of from 3.5 to 4.5 percent of the low lactose solid and from 9.5 to 8.5 percent of the regular serum solids proved most satisfactory, and when used in these proportions the whipping ability of the mixes was only slightly affected. The use of a higher proportion of low lactose solids resulted in a dry crumbly ice cream, but replacing one-fourth of the sucrose with dextrose tended to overcome this difficulty.

Consumers' preference for ice cream, H. P. Smith and P. H. Tracy. (Univ. Ill.). (*Dairy Indus., 3 (1938), No. 10, pp. 397–399*).—Records based on a questionnaire survey and on the actual sampling of ice creams by 179 individuals indicated that customers generally prefer ice cream having a smooth body and texture, medium butterfat content, high serum solids, medium to high sugar, and medium yellow color. A stabilizer appeared to be a desirable constituent of ice cream. A greater percentage of women than men preferred an ice cream with pronounced flavor and heavy body.

VETERINARY MEDICINE

Animal pathology, R. A. Runnells (*Ames. Iowa: Collegiate Press, Inc., 1938, pp. XVI+464, figs. 127*).—Part 1 of this manual relates to general pathology (pp. 1–184), part 2 to systemic pathology (pp. 185–352), and part 3 to special pathology of the specific infectious diseases (pp. 353–449).

Report of the Ontario Veterinary College, 1936 (*Ontario Vet. Col. Rpt., 1936, pp. 30, figs. 7*).—Contributions in this report (E. S. R., 77, p. 848) include the following: Studies in Joint-Ill of Foals, by F. W. Schofield (pp. 11, 12); Joint-Ill in Foals, by R. A. McIntosh (pp. 13–15); A Simple and Effective Method of Administering Iron for the Prevention of Anemia in Piglets (pp. 16, 17), Acute Fatal Rhinitis in Calves (Due to *Corynebacterium pyogenes*) (pp. 17, 18), and An Obstinate Case of Warts (Verrucosis) Successfully Treated With Autogenous Tissue Vaccine (p. 19), all by F. W. Schofield; Suspected Forage Poisoning: Report of an Investigation in Which Six Cattle Were Lost in Dufferin County (pp. 20, 21) and Pyelonephritis (pp. 21–23), both by R. A. McIntosh; Tuberculosis in a Horse, by F. W. Schoenfield and H. R. Potter (pp. 23–26); and Diseases of Swine: Report of an Investigation of Extensive Pig Losses in the County of Kent, by R. A. McIntosh (pp. 27, 28).

[Contributions on animal pathology and parasitology] (*Indian Jour. Vet. Sci. and Anim. Husb., 8 (1938), No. 3, pp. 183–223, 235–237, 249, 250, pls. 12, fig. 1*).—Contributions presented include the following: On the Nuclear Structure of *Babesia bigemina* (Smith and Kilbourne), by H. N. Ray (pp. 183-186); Rhinosporidiosis in Bovines in the Madras Presidency, With a Discussion on the Probable Modes of Infection, by M. A. N. Rao (pp. 187–198); Studies on a Natural Outbreak of Pigeon-Pox, by R. L. Kaura and S. Ganapathy Iyer (pp. 199–211); A New Trematode, *Prosthogonimus indicus* n. sp., Occurring in the Oviduct of Indian Fowls, With Remarks on "Prosthogonimiasis," by H. D. Srivastava (pp. 213–220); Rhinosporidiosis in Equines, by L. Sahai (pp. 221–223); *Pseudanoplocephala crawfordi* Baylis 1927, by S. Vaithianatha Mudaliar and K. S. Gopalakrishna Iyer (pp. 235–237); and The Occurrence of an Unrecorded Filarid Nematode, *Onchocerca cervicalis* Railliet and Henry 1910, in the Ligamentum Nuchae of Horses in India, by H. D. Srivastava (pp. 249, 250).

Report of the director of veterinary research for the year 1936 [and 1937], D. A. Lawrence (*South. Rhodesia, Dir. Vet. Res. Rpt., 1936, pp. [1]+12; 1937, pp. [1]+12*).—The occurrence of and progress of control work with infectious diseases of livestock are reported (E. S. R., 76, p. 689).

A study of Actinomyces necrophorus in soil cultures, E. A. Tunnicliff. (Mont. Expt. Sta. et al.). (*Jour. Infect. Diseases, 62 (1938), No. 1, pp. 58–65*).—Attempts made to cultivate foot rot strains of *A. necrophorus* in soil mediums confirm the conclusion that this organism normally remains alive under natural soil conditions for only a short time, although, exceptionally, a small percentage of the organisms may survive for an extended period. It cannot be classified as a saprophyte in the soil, since no reproduction was noted in the small percentage of cultures in which viability was demonstrated.

Growing larval Ascaridia lineata (Nematoda) in vitro, J. E. Ackert, A. C. Todd, and W. A. Tanner. (Kans. Expt. Sta.). (*Amer. Micros. Soc. Trans., 57 (1938), No. 3, pp. 292–296*).—Evidence is presented, apparently for the first time, of the growth of an ascarid larva in vitro. Young larvae of the nematode *A. lineata* (Schneid.) removed from their natural habitat in the chicken intestine were transferred immediately to culture media and incubated at 106°–108° F., normal temperatures of chickens. Among the culture media in which the larvae grew were (1) incubating hens' eggs, (2) carbohydrate mixtures of starch and dextrose upon a basic medium of dextrose corn meal agar plates covered with sterile saline solution, and (3) a salt-dextrose solution upon the same basic medium. In 9 days larvae made growths up to 25.9 mm, which represented an increase of 53.8 percent of the length of the larvae when placed in the medium. Control worms of similar age and size when cultured in isotonic saline solution failed to make any growth.

Observations of the mode of action of several anthelmintics upon Ascaris lumbricoides (pig strain), H. W. Brown (*Amer. Jour. Hyg., 26 (1937), No. 1, pp. 72–83*).—In the studies reported it was shown that ascarids will ingest various solutions such as normal saline and mineral oil, and also solutions of certain anthelmintics such as carbon tetrachloride in mineral oil. On the other hand, they refuse to ingest mineral oil solutions of chenopodium, even in very great dilution. The anthelmintics studied were found to act more rapidly when ascarids are immersed in solutions or suspensions of them than when such solutions are injected orally into the gastrointestinal tract of the parasite. Thus it appears that the mode of action of these anthelmintics on ascarids is through the body wall rather than after ingestion by the parasite. These experiments have also shown that a delayed death results when a small portion of a worm is injured by an anthelmintic applied locally.

The transmission of influenza virus "W. S." to the Chinese mink and the David's squirrel, F. F. Tang (*Brit. Jour. Expt. Path., 19 (1938), No. 3, pp. 179–183, fig. 1*).—The Chinese mink (*Mustela sibirica*) has been found fully susceptible to the W. S. strain of influenza virus, and it is suggested that this species might be used instead of the ferret for influenza studies. David's squirrel (*Sciurotamias davidianus*) is also susceptible to the influenza infection, but the virus may die out in serial transmission. However, serial passage was maintained for 10 generations.

Cultivation of the rabies virus on the chorio-allantoic membrane of the developing egg, N. Veeraraghavan and G. L. C. Philipsz (*Indian Jour. Med. Res., 26 (1938), No. 2, pp. 493–495, pl. 1*).—In the work reported the author was unsuccessful in cultivating the rabies virus on the chorioallantoic membrane of the developing egg.

Is there a relationship between the viruses of rinderpest and Doyle's disease? V. R. Rajagopalan (*Indian Jour. Vet. Sci. and Anim. Husb., 7 (1937), No. 1, pp. 59–64*).—It is shown that the rinderpest virus does not give rise to Doyle's disease and vice versa, and that no cross-immunity occurs between the two viruses.

The toxicity of young cells of Salmonella paratyphi A and B when lysed by bacteriophage, R. E. Gordon and C. N. Stark. (Cornell Univ.). (*Jour. Infect. Diseases, 62 (1938), No. 1, pp. 45–47*).—The findings reported indicate that young bacterial cells of *S. paratyphi* A and B, the autolyzed mature cells of which produce a toxic substance, do not liberate a filtrable toxic material in amounts detectable by methods employed in this study.

Rocky Mountain spotted fever and tick survey in Iowa, C. F. Jordan (*Amer. Jour. Pub. Health, 28 (1938), No. 12, pp. 1411–1414*).—Included in this account are the results of a survey of the spotted fever transmitting agent of the East, the American dog tick. Of some 350 individual ticks collected in 35 counties of Iowa, all belonged to this species. Guinea pig tests consisting of the injection of tick substance from 30 groups of ticks gave no evidence of the presence of spotted fever virus. *Bacterium tularense* was recovered from ticks collected in 3 counties in southeastern Iowa, 2 of the 3 batches having been removed from dogs.

Metabolic studies of a non-hemolytic streptococcus, J. W. King, J. C. Garey, and M. A. Farrell. (Pa. State Col.). (*Jour. Bact., 36 (1938), No. 3, pp. 251, 252*).

Streptococcic mastitis and public health, P. B. Brooks (*Jour. Amer. Vet. Med Assoc., 94 (1939), No. 1, pp. 11–15, figs. 2*).—A discussion.

The control of sylvatic plague vectors, M. A. Stewart and D. B. Mackie (*Amer. Jour. Hyg., 28 (1938), No. 3, pp. 469–480*).—The authors find that control of fleas in rodent burrows, as well as control of the rodents themselves, necessary in the effective suppression of sylvatic plague, may be accomplished by fumigation with methyl bromide. "All stages from the egg to the adult are susceptible to this fumigant, but the adults are more easily killed than are the immature stages. It appears from field tests that the dosage of liquid methyl bromide, approximately 10 cc per burrow opening, ordinarily used to kill ground squirrels is also sufficient to kill the fleas in all stages of development. It is believed that the spread of bubonic plague occurring through the transportation of plague-flea infested grains, cereals, etc., may be effectively checked by fumigating these cargoes with methyl bromide and that the materials so treated will not in any way be rendered unfit for human consumption."

Taenia saginata, P. Emsbo (*Skand. Vet. Tidskr., 28 (1938), No. 5, pp. 289–312, figs. 4; Eng. abs., p. 312*).—The present knowledge of the tapeworm *T. saginata* in man and of the corresponding cysticercus (*Cysticercus inermis*) in cattle is summarized.

Comparative studies of pathogenic trichomonads, H. Wittfogel (*Vergleichende Studien über pathogene Trichomonaden. Inaug. Diss., Hyg. Inst., Tierarztl. Hochsch., Hannover, 1935, pp. 68*).—Studies of *Trichomonas vaginalis bovis*, *T. columbae*, and *T. vaginalis hominis* are reported upon, accompanied by a list of 82 references to the literature.

Sulfanilamide in undulant fever, E. C. Bartels (*New England Jour. Med., 219 (1938), No. 25, p. 988, fig. 1*).—Report is made of a case of undulant fever in which there was an apparently specific response to the administration of sulfanilamide. The diagnosis was verified by a positive agglutination test and a positive blood culture.

Quantitative studies on the biology of Xenopsylla cheopis (Siphonaptera), P. A. Buxton (*Indian Jour. Med. Res., 26 (1938), No. 2, pp. 505–530, figs. 5*).—Included in this report is a description of an apparatus in which a rodent and a population of fleas may be maintained under conditions which are almost natural and at the same time capable of control and measurement.

On the importance of protozoa of the paunch for the health of ruminants, M. Koffman (*Skand. Vet. Tidskr., 28 (1938), No. 2, pp. 106–143, figs. 5; Eng. abs., pp. 140–143*).—An account is given of experiments aimed at the improvement of the microfauna of the paunch in sheep.

Report of Conference on Bang's Disease of the North Atlantic States (*[Springfield, Mass.: New England Homestead, 1937], pp. 3–40, 51–80*).—Contributions presented at the conference held at Springfield, Mass., on May 26 and 27, 1937, include the following: Progress in the Bang's Disease Control Program, by A. E. Wight (pp. 3–6) (U. S. D. A.); Bang's Disease Control Under the Area Plan, by H. C. Givens (pp. 6 11); New Hampshire's Program of Bang's Disease Control, by R. W. Smith (pp. 15–20); Undulant Fever in Man and Its Relation to Bang's Disease in Livestock, by G. W. Anderson (pp. 20–23); Vaccination Against Bang's Disease, by W. E. Cotton (pp. 24–30) (U. S. D. A.); Some Pitfalls in Maintaining a Disease-Free Herd From a Breeder's Viewpoint, by E. C. Deubler (pp. 30–35); Progress in Bang Disease Control in Pennsylvania, by M. F. Barnes (pp. 36–40); Progress in Bang's Disease Control in Wisconsin, by W. Wisnicky (pp. 51–56); The Problem of Controlling Bang's Disease in Large Dairy Herds, by J. G. Hardenbergh (pp. 58–61); Bang's Disease Control in Connecticut, by G. E. Corwin (pp. 62–66); The Attitude of Breed Associations Toward Bang's Disease, by A. J. Glover (pp. 67–69); Reinfection of Herds, by R. R. Birch (pp. 69–71); and The Suspect—How Should it be Handled? by L. F. Rettger (pp. 71–75) ([Conn.] Storrs Expt. Sta.).

Progress in the control of Bang's disease and mastitis in Illinois, R. Graham (*In Dairy Manufactures Conference Manual, Department of Dairy Husbandry, University of Illinois, Urbana, Illinois, November 17–20, 1937. Urbana: Ill. Univ., 1937, pp. 155–172, [figs. 3]*).—A review of the knowledge of and progress in control work with infectious abortion and mastitis in Illinois.

Effect of Prontosil and sulfanilamide on Brucella abortus infection in two cows, E. E. Hamann and I. F. Huddleson. (Mich. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 1, pp. 35–37*).—A preliminary report is made of the experimental treatment of two *Brucella*-infected Jersey cows by the administration of Prontosil and sulfanilamide. Further work is considered necessary before any definite conclusions can be arrived at.

Vaccination of calves and yearlings against Bang's disease, J. M. Buck, W. E. Cotton, and H. E. Smith (*U. S. Dept. Agr., Tech. Bul. 658 (1938), pp. 7*).—Results obtained in the vaccination of calves and yearlings against Bang's disease are reported, the details being given in tables. In an experiment conducted from 1932 to 1934, 6 calves about 6 mo. of age and 5 yearling heifers were vaccinated, two vaccines being used. One of the two was prepared from a *Brucella abortus* strain that had been artificially cultivated for about 10 yr. and become much reduced in virulence. The other was from a strain which produced extensive lesions in guinea pigs injected with it and caused the blood serums of all the animals to react to the agglutination test in high titers. "When pregnant, these animals and 12 unvaccinated pregnant heifers were exposed through the conjunctiva to *B. abortus* or by contact with infected animals. The exposure failed to transmit Bang's disease to any of the vaccinated animals, as indicated by guinea-pig-inoculation results with uterine material and colostrum at time of calving. The 5 animals vaccinated during calfhood that produced vigorous calves gave negative results to the agglutination test at time of calving. On the other hand, 3 of the animals vaccinated when yearlings reacted in a titer of 1:100 and the fourth in a titer of 1:200 when they produced their calves. Close contact for 24-hr. periods at different times with 5 cows that had recently aborted resulted in the transmission of Bang's disease to 3 of 7, or 43 percent, of the pregnant heifers used as controls. A single conjunctival exposure transmitted it to 4 of 5, or 80 percent, of the control animals used."

It is concluded that the use of abortion vaccine in calves gives indication of having a distinct advantage over its use in more mature unbred heifers, since in the calves the agglutinins that are caused to appear in the blood serum by the vaccine injections disappear more promptly and more regularly.

Infectious abortion in imported dairy cows, T. Topacio and R. A. Acevedo (*Philippine Jour. Anim. Indus.*, *5* (*1938*), *No. 5*, *pp. 479–488*).—The occurrence of Bang's disease in imported cows in two dairies in Cebu is described and reported upon, two strains of organisms having been isolated, studied, and identified beyond question as *Brucella abortus*.

Some observations on the nature and transmission of enzootic broncho-pneumonia (pneumoenteritis) of dairy calves, D. A. Sanders. (Fla. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, *94* (*1939*), *No. 1*, *pp. 28–31*).—Studies of an enzootic broncho-pneumonia of calves and yearlings on dairy farms in Florida, both acute and chronic in form, have shown it to cause heavy loss among calves under 6 mo. of age confined in crowded, unsanitary, permanent lots. Losses have also been recorded in lambs, pigs, kids, and foals. In the herds under observation there is a tendency for the condition to recur year after year. The mortality rate frequently amounts to 60 or 70 percent of the annual calf crop. Further loss is sustained since animals that survive the infection are underdeveloped, unthrifty, and unprofitable. "*Escherichia coli*, *Pasteurella boviseptica*, and species of *Staphylococcus* and *Penicillium* were found to be associated with the condition. Older calves affected with the chronic form of enzootic broncho-pneumonia were found to be infested with various species of internal parasites, including coccidia, *Eimeria*, sp.; hookworm, *Bunoctomum phlebotomum;* whipworm, *Trichuris ovis;* tapeworm, *Moniezia benedeni;* nodular worm, *Oesophagostomum radiatum;* lungworm, *Dictyocaulus viviparus;* stomach worm, *Haemonchus contortus;* filaria, *Setaria labiato-papillosa;* and the external blood-sucking louse *Linognathus vituli*. No single predisposing factor has been found that reproduced typical broncho-pneumonia as observed under field conditions."

Theileriasis of cattle in India, S. K. Sen and M. K. Srinivasan (*Indian Jour. Vet. Sci. and Anim. Husb.*, *7* (*1937*), *No. 1*, *pp. 15–37*, *pl. 1*, *figs. 3*).—This contribution, presented with a list of 25 references to the literature, reports upon acute or fatal forms of bovine theileriasis as observed in imported Friesian bulls and in Indian cattle.

On the value of the tuberculin tests as applied to various domestic animals, especially cattle, N. Plum (*Skand. Vet. Tidskr.*, *28* (*1938*), *No. 2*, *pp. 97–105*, *Swed. abs.*, *p. 105*).—A brief summary is given of the value of the tuberculin tests as applied to the various species of domestic animals, particularly cattle, with a brief mention of the infection with acidfast bacilli. A brief review of the response of cattle to homologous and heterologous tuberculins in various tests is included.

Cultivation of sheep-pox virus on the chorio-allantoic membrane of the chick embryo, R. Sanjiva Rao (*Indian Jour. Med. Res.*, *26* (*1938*), *No. 2*, *pp. 497–504*).—A description is given of the cultivation of sheep pox virus on the chorioallantoic membrane of the developing egg, and the naked eye appearances and histological features of the lesions are defined. The cultured virus was found to be definitely modified in character by passage. "Immunity experiments indicate common antigenicity to a limited extent between the cultured virus and vaccinia virus. Cultured virus, while inducing a purely local reaction in sheep, appreciably protects against subsequent infection with the natural virus. The possibility of its use for prophylaxis is suggested."

Tapeworm studies.—V, Absence of M. expansa from the sheep intestine early after infection, N. R. Stoll (*Amer. Jour. Hyg., 26 (1937), No. 1, pp. 148–161, fig. 1*).—Experiments in which closely related sheep and lambs were exposed to a tapeworm (*Moniezia expansa*) infested pasture are reported. "Animals exposed 7 (in one case 8) days and then killed immediately, showed no tapeworms. Control animals, exposed on pasture with them, but subsequently held indoors several days before killing, were positive. Other control animals kept in the area showed by later fecal examination contraction of the infection referable to the test period. The earliest after initial exposure that an animal has shown tapeworms at autopsy is 9 days. The sizes of strobilae recovered from sheep killed 12 days or more after removal from an infested area are surprisingly small, when considered with the demonstrably rapid growth of the cestodes in the intestine. In contrast to results with *M. expansa,* tapeworms contracted by the ingestion of intermediate stages are recoverable as definitive forms from the intestine of the final host the first day or so after infection. These facts fit the hypothesis of a preliminary tissue invasive stage for *M. expansa* in sheep. The characteristic immunity which develops in sheep against *M. expansa* is likewise suggestive of a tissue invasive stage. Such immunities obtain against forms like *Taenia taeniaeformis* and *T. saginata* in their intermediate but not in their definitive hosts. Immunity also develops against *Hymenolepis fraterna,* which has both the intermediate and definitive stage in the same rat host." A list of 27 references to the literature is included.

Tapeworm studies.—VI, Beginning of reproductive maturity of Moniezia expansa in sheep, N. R. Stoll (In *Festschr. Bernhard Nocht zum 80. Geburtstag. Hamburg: Friederichsen de Gruyter & Co., 1937, pp. 611–619*).—In this continuation of studies noted above, evidence is presented that reproductive maturity of the tapeworm *M. expansa* in sheep is demonstrable from 35 to 38 days after exposure to infection. Exceptional cases occur in which this minimum period is exceeded, although conditions governing this are not clear. No evidence has thus far been secured from animals autopsied before eggs or proglottids appeared in the dung that reproductive maturity of *M. expansa* is apt to occur much earlier than the thirty-fifth day.

Caseous lymphadenitis of goats, T. Topacio (*Philippine Jour. Anim. Indus., 5 (1938), No. 5, pp. 457–463, pl. 1*).—This contribution reports upon caseous lymphadenitis or pseudotuberculosis, a disease of sheep which attacks goats, that had not been observed in the Philippines for 30 yr. The disease was discovered among Government-owned goats under observation, but no cases have been observed among native sheep or native goats belonging to private parties.

The control and eradication of infectious abortion in swine, E. L. Millenbruck ([*War Dept. U. S.*], *Off. Surg. Gen., Vet. Bul., 32 (1938), No. 2, pp. 137–141*).—An investigation of swine made in the fall of 1935 at Fort Bragg, N. C., revealed the presence of infectious abortion. The measures employed in controlling and eradicating the disease consisted of those commonly applied in any eradication and control program of contagious and infectious diseases, namely, (1) an early and accurate diagnosis, (2) isolation and proper control of infectious carriers, and (3) the destruction of the infectious organisms by the application of strong and effective germicides.

Onion poisoning in horses, F. Thorp, Jr., and G. S. Harshfield. (Colo. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 1, pp. 52, 53*).—Brief report is made of an outbreak of onion poisoning occurring on a farm where nine horses had access to unharvested onions. The motality was high, seven of the animals having succumbed. The sick animals showed anemia, icterus, and coffee-colored urine. These observations are said to confirm the findings of other workers who report losses in cattle and anemia in dogs.

Sodium iodide and mercuric iodide treatment of epizootic lymphangitis in horses, M. Muñoz (*Philippine Jour. Anim. Indus., 5 (1938), No. 5, pp. 489–492*).—The intravenous injection of 2 g of sodium iodide and 0.2 g of red iodide of mercury dissolved in 20 cc of sterile distilled water for six successive days was found to be quite safe and an effective treatment of epizootic lymphangitis.

Equine encephalomyelitis, J. D. Derrick (*[War Dept. U. S.], Off. Surg. Gen., Vet. Bul., 32 (1938), No. 2, pp. 133–136*).—Extracts from a report of the Seventh Army Corps Area are presented. The type of infection observed during an epidemic in August and September 1937 appeared to be more virulent than during earlier years; the incubation period varied from 7 to 21 days.

A fatal disease of pigeons caused by the virus of the eastern variety of equine encephalomyelitis, L. D. Fothergill and J. H. Dingle (*Science, 88 (1938), No. 2293, pp. 549, 550*).—In an investigation conducted during the outbreak of equine encephalomyelitis in southeastern Massachusetts in 1938 (E. S. R., 80, p. 397), in which pigeon breeders suffered unusual losses in their flocks, the eastern form of the virus was recovered from the brain of a pigeon that had spontaneously contracted the disease in an area where it was prevalent among horses. This is thought to be the first report of the isolation of the virus from pigeons dying from natural infection.

Outbreak of encephalitis in man due to the eastern virus of equine encephalomyelitis, R. F. Feemster (*Amer. Jour. Pub. Health, 28 (1938), No. 12, pp. 1403–1410, figs. 2*).—Investigations conducted during the outbreak of encephalomyelitis referred to above indicated that the clinical picture and pathological findings in the eight cases of human encephalomyelitis are sufficiently characteristic to make recognition of the disease possible. While young children seem to be particularly vulnerable, adults are occasionally affected. The case fatality was high, 25 of the 38 under investigation having succumbed. On the other hand, the attack rate among horses was low (3.5 percent), but the case fatality was over 90 percent. Thirteen references to the literature are included.

Venezuelan equine encephalomyelitis, C. E. Beck and R. W. G. Wyckoff (*Science, 88 (1938), No. 2292, p. 530*).—A brief report is made of the results of a study of the virus present in portions of the brains of animals dying from equine encephalomyelitis in Venezuela. When inoculated into guinea pigs, mice, and chicken embryos the symptoms resembled those of the eastern type of the disease, but tests have demonstrated that it is immunologically different from both the eastern and western forms. Though as yet insufficient to settle the question, the results suggest that a remote relationship may exist between the eastern and Venezuelan strains. No comparisons with the viruses of Borna's disease or of Russian encephalomyelitis have as yet been possible.

Complement fixation with chick-embryo antigen in equine encephalomyelitis, W. M. Mohler. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 1, pp. 39–43*).—The complement fixation tests conducted have shown the presence of antibodies in horses recently immunized against equine encephalomyelitis, suggesting the possibility of its use as an aid in determining the potency of curative serum produced by hyperimmunizing horses.

Pneumonia in foals due to Corynebacterium equi, V. R. Rajagopalan (*Indian Jour. Vet. Sci. and Anim. Husb., 7 (1937), No. 11, pp. 38–53, pls. 4, figs. 2*).—A report is made of a form of pneumonia which occurs with some frequency in certain breeding studs in the Punjab, and thought to be identical with that reported by Magnusson as occurring in Sweden (E. S. R., 50, p. 685).

The infection is generally confined to foals about 1 to 2 mo. old, and occasionally symptoms of joint ill are observed in addition to those of pneumonia. *C. equi*, the causative agent, can be recovered in nearly every case in pure culture from the abscesses in the lungs and mediastinal glands, as well as from the feces, sometimes from the heart blood, and, rarely, from the joint fluid of naturally as well as artificially infected feces. The cultural and biochemical characteristics of the organism are described.

A report on the first outbreak of surra in British North Borneo and its control measure, L. M. Yutuc (*Philippine Jour. Anim. Indus., 5 (1938), No. 5, pp. 501–515, pls. 4*).—Report is made of an epizootic of surra among ponies of British North Borneo which threatened to exterminate the pony population of the island.

Observations on the occurrence of heartworms (Dirofilaria immitis (Leidy 1856)) in New England dogs, D. L. Augustine (*Amer. Jour. Hyg., 28 (1938), No. 3, pp. 390–395*).—Infestation by the heartworm (*D. immitis*) was found in 8 of 94 dogs examined in eastern Massachusetts. It was not detected in foxes of the same locality nor in dogs at a point in New Hampshire. The parasite is said to be indigenous to eastern Massachusetts and is the cause of severe disease in native dogs. Evidence was obtained which indicates the occurrence of prenatal infection with *D. immitis*.

The influence of the ration on mortality from caecal coccidiosis in chicks, E. R. Becker and P. C. Waters (*Iowa State Col. Jour. Sci., 12 (1938), No. 3, pp. 405–414*).—Six experiments are considered at some length. The combination of dried skim milk and wheat middlings or dried buttermilk and wheat middlings in the ordinary type of chick ration was found to be responsible for a high death rate in White Leghorn chicks experimentally infected with cecal coccidiosis. Dried buttermilk of itself was also culpable when fed in the ordinary type of chick ration.

Studies on the effect of X rays on the pathogenicity of Eimeria tenella, A. A. Albanese and H. Smetana (*Amer. Jour. Hyg., 26 (1937), No. 1, pp. 27–39*).—Studies conducted with a view of determining the therapeutic effect of X-rays on oocysts of *E. tenella* in vitro and the consequent influence on the course of the disease in chicks due to such radiated organisms are reported. It was found that experimental infection with oocysts of *E. tenella* irradiated with X-rays of 9,000 r-units at 75 r/min. was much less severe than that produced in controls. "Exposure of oocysts of *E. tenella* to X-rays of 13,500 or more r-units at 75 r/min. rendered the organisms ineffective for experimental infection; 13,500 r-units at 75 r/min. constitutes the minimum prophylactic dosage under the given experimental conditions. Experimental infection with oocysts exposed to X-rays of from 2,250 to 4,500 r-units at 75 r/min. caused an increased production of organisms during the patent period, suggesting a stimulating action of these sublethal doses on the oocysts. Experimental infection with oocysts irradiated with low intensity X-rays of 4,500 or more r-units at 75 r/min. was followed by a definite shortening of the patent period and a slight prolongation of the prepatent period. Infection with oocysts exposed to 2,250 r-units was characterized by a normal prepatent period and a prolonged patent period. Irradiation with high intensity X-rays of 104 r-units/min. was much more effective in damaging the oocysts of *E. tenella* in vitro than X-rays of low intensity. Nonsporulated oocysts were found to be 15 times more sensitive to X-rays than sporulated oocysts. In vitro excystation of oocysts irradiated with X-rays was greatly reduced as compared to that of nonirradiated controls."

Attempts to transmit fowl paralysis, C. Olson. (Cornell Univ.). (*Jour. Infect. Diseases, 61 (1937), No. 3, pp. 325–330*).—Experimental attempts to transmit fowl paralysis to normal chickens by means of intraneural implantation of affected nerve tissue and by means of a cross-circulation of the blood between a diseased and a normal chicken met with uniform failure.

An outbreak of pox in turkeys, with notes on diagnosis and immunization, C. A. Brandly and G. L. Dunlap. (Univ. Ill.). (*Poultry Sci., 17 (1938), No. 6, pp. 511–515, figs. 4*).—In the course of an investigation made during the study of an outbreak of fowl pox in a flock at Delavan, Ill., the early diagnosis of this outbreak among young turkeys and the institution of control measures were facilitated by the demonstration of Borrel bodies in fresh smears of tissue lesion material. Gross differences in the appearance and nature of pox lesions in chickens and turkeys were observed to be associated with differences in cellular response in the tissues of the two species. Unlike strains of turkey pox described by others, this strain of pox virus possessed a low or indifferent pathogenicity for chickens and attempts to adapt it to the latter species were unsuccessful. The applications and limitations of various methods or procedures of diagnosis of pox in birds are discussed. Control of the outbreak was accomplished successfully by vaccination with a strain of fowl pox virus in the form of infected chorioallantoic tissue of developing chicken embryos.

Comparative studies of Salmonella pullorum and Salmonella gallinarum, J. A. Dumaresq (*Austral. Jour. Expt. Biol. and Med. Sci., 16 (1938), No. 4, pp. 361–369*).—In comparative cultural studies of four strains of *S. gallinarum* and eight strains of *S. pullorum*, the strains of both could be differentiated by the fermentation of maltose, dulcitol, sodium mucate, and sodium potassium tartrate by *S. gallinarum* and not by *S. pullorum*. They could also be differentiated by their reactions in litmus milk and bromothymol blue agar. No significant serological differences could be detected by cross agglutination or agglutinin absorption. No Vi antigen could be detected in a single strain examined from each species.

Flukes in the respiratory tract of ducks, F. R. Beaudette. (N. J. Expt. Stas.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 1, p. 44*).—Record is made of the parasitism of mallard ducks by the fluke *Typhlocoelum cymbium* (Dies. 1850) Koss. 1911, in New Jersey. The presence of the nematode *Epomidiostomum uncinatum* in this host is also reported.

Neurolymphomatosis phasianorum, E. Jungherr. ([Conn.] Storrs Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 1, pp. 49–52, figs. 5*).—Report is made of the outbreak of a fowl paralysislike condition in a commercial flock of about 1,000 4-month-old ring-necked pheasants. About 3 percent of the birds were affected. "Until the etiologic identity of the chicken and pheasant disease can be established, the term neurolymphomatosis phasianorum is proposed. The diagnosis was based upon ineffectiveness of treatment with chick-antiparalytic factors (B_4 and antiencephalomalacic) and upon the demonstration of histologic lymphomatotic lesions in the parenchymatous organs and the peripheral and central nervous systems. Some cases were associated with myodegeneration and perimysial proliferation in the striated muscles. The findings suggest absence of species-specificity of neurolymphomatosis and the possibility of using pheasants in experimental transmission of fowl paralysis."

The presence and distribution of Hexamita sp. in turkeys in California, W. R. Hinshaw, E. McNeil, and C. A. Kofoid. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 3, p. 160*).—The authors report having found a diplozoic flagellate of the genus *Hexamita* in turkeys suffering from enteritis that is similar to and probably the same as the infection described by Gierke and Hinshaw (E. S. R., 74, p. 701) and Hinshaw (E. S. R., 78, p. 857). In the acute stage of the disease the flagellate was present in large numbers throughout the small intestine and in fewer numbers in the ceca. "It is usually also found in the bursa of Fabricius, and in poults killed after they reached a comatose condition it was found in a few instances in the abdominal cavity and in the liver. In the convalescent stages there seems to be a tendency toward a diminution in numbers in the duodenum and a persistence of large numbers in the lower jejunum, ileum, and bursa of Fabricius. It has been found in the bursa in turkeys up to 5 mo. of age." A list is given of 13 references to the literature.

The spontaneous transmission of IV-variants of Salmonella aertrycke from pigeons to rabbits, H. A. Hoffmann and P. R. Edwards. (Ky. Expt. Sta.). (*Amer. Jour. Hyg., 26 (1937), No. 1, pp. 135–137*).—Examinations made of rabbits which had succumbed to an epizootic disease that caused high mortality on a ranch near Sebastopol, Calif., led to the isolation of IV-variants of *S. aertrycke*. It is considered probable that the infection originated in pigeons from a highly insanitary loft close to the rabbit hutch.

Diseases of fur-bearing animals and their control, G. Schoop (*Krankheiten der Edelpelztiere und ihre Bekämpfung. Hannover: M. & H. Schaper, 1938, pp. 193, figs. 93*).—A summary of information on the diseases and parasites of fur-bearing animals and means for their control.

AGRICULTURAL ENGINEERING

Ground water in south-central Pennsylvania, S. W. Lohman (*Pa. Topog. and Geol. Survey Bul. W–5 (1938), pp. VII+315, pls. 17, figs. 11*).—This report describes the geography, geology, and ground-water conditions in an area comprising 9,769 sq. miles in the south-central part of Pennsylvania, including 14 counties and parts of the ridge and valley physiographic province and the Appalachian Plateaus province. The basic field data comprise tabulated records of more than 1,100 wells and springs, and chemical analyses of 92 samples of ground water from representative wells and springs and of 5 samples of water from streams. Descriptions of all public supplies that utilize ground water as a sole or auxiliary source are given. The weekly depths to water level in 4 unused wells since the fall of 1931 are given in graphic form.

Quality of water of the Rio Grande Basin above Fort Quitman, Texas, C. S. Scofield (*U. S. Geol. Survey, Water-Supply Paper 839 (1938), pp. II+294*).—This report is composed of analytical data obtained in part from field investigations conducted in 1936 by the Geological Survey, and in 1935 and 1936 by the State of Texas in cooperation with the Rio Grande Joint Investigation sponsored by the National Resources Committee, and in part from an investigation conducted since 1930 by the U. S. D. A. Bureau of Plant Industry in cooperation with other agencies.

Public Roads, [December 1938 and January 1939] (*U. S. Dept. Agr., Pub. Roads, 19 (1938), Nos. 10, pp.* [2]+*193–208*+[2], *figs. 17; 11, pp.* [2]+*209–223*+[1], *figs. 9*).—These numbers of this periodical contain data on the status of Federal-aid highway, grade-crossing, and secondary or feeder road projects, as of November 30, and December 31, 1938, and these articles:

No. 10.—Principles of Soil Mechanics Involved in the Design of Retaining Walls and Bridge Abutments, by L. A. Palmer (pp. 193–207).

No. 11.—Procedure Employed in Analyzing Passing Practices of Motor Vehicles, by E. H. Holmes (pp. 209–212, 221); and A Simple Portable Automatic Traffic Counter, by R. E. Craig and S. E. Reymer (pp. 213–221).

Motor fuels from farm products, J. B. Jacobs and H. P. Newton (*U. S. Dept. Agr., Misc. Pub. 327 (1938), pp. 129, figs. 31*).—The agricultural, technical, and economic aspects are considered.

Blends of ethyl alcohol with gasoline are deemed satisfactory as fuels for present-type internal-combustion engines, especially with increased engine compression ratios and other favorable changes in design. The best blend for present conditions is that containing about 10 percent of alcohol, although other percentages can be used. To secure uniformity of concentration and employment of alcohol blends desirable, all motor fuels should be nationally standardized.

Present crop production is found inadequate to permit alcohol production for a national 10-percent blend without encroachment on normal feed, food, and industrial supplies. Alcohol production from present crop wastes, culls, and surpluses is estimated as unlikely to be continuously adequate for a national 5-percent blend. Such materials would provide uncertain annual quantities of alcohol at variable costs.

Present commercial alcohol production equipment and processes are described, their adaptability to fuel alcohol production is discussed, and economic readjustments entailed in the national use of sufficient alcohol fuel to be effective in petroleum conservation are considered.

Preventing gin damage to cotton, F. L. Gerdes and C. A. Bennett (*U. S. Dept. Agr. Leaflet 169 (1938), pp. 8, figs. 3*).—Dampness of the seed cotton and wear, inaccurate adjustment, or inaccurate speed regulation in the gin are found the main causes of gin damage. Unevenness, with resulting loss in grade and price, will result from ginning into the same bale cotton not uniform with respect to moisture, foreign matter, fiber length, color, strength, etc.; also from nonuniform gin operation practices.

Mechanical driers, commercial or home-made, will largely eliminate the damp cotton troubles. In the gin itself, use of saws one-sixteenth of an inch under size due to wear and sharpening, broken saw teeth, incorrect tooth pitch, and worn ribs are to be avoided; and saws must be run at or near the specified speeds. In brush doffing, reasonable departures from the standard of 6,666 lin. ft. per minute are harmless, but brushes must have full-tooth mesh with the saws, and worn or saw-cut bristles cause poor doffing and gin damage. In air-blast doffing, correct nozzle pressure must be maintained and is best checked by air-blast gages. Corrections of the setting of seed, mote, and dividing boards are similarly dealt with, as is the timing of the feeder speed. Feeder speed must be equal to or less than manufacturer's specification to avoid tight seed rolls and concomitant gin damage. Roughness and projections in lint flues and condensers may also cause damage and interrupted operation.

Developments in mechanical equipment and methods in sugar-beet production, E. M. Mervine and S. W. McBirney. (Coop. Colo. and Calif. Expt. Stas.). (*U. S. Dept. Agr. Circ. 488 (1938), pp. 38, figs. 31.*)—This circular presents, for the use of growers, the results of tests of methods and equipment designed to increase yields and reduce costs, and is also intended to suggest to manufacturers possible improvements in sugar beet-production machinery. It covers planting equipment, including initial stands, planters, furrow openers, seeding rate and calibration, regulating planting depth, row spacing, hill planting, bed planting, and crust-breaking equipment; cultivation; equipment for large-scale production; cross blocking; thinning tools; beet lifters; mechanical harvesters; dump body; and hauling.

AGRICULTURAL ECONOMICS

Report of the Chief of the Bureau of Agricultural Economics, 1938, A. G. Black (*U. S. Dept. Agr., Bur. Agr. Econ. Rpt., 1938, pp. 36*).—This report covers the activities of the Bureau during the year ended June 30, 1938. The lines of work conducted by the Bureau are described, and some general findings as to mortgage debt, commercial loans, agricultural exports-imports, land development and new uses, farm population shifts, farm-adjustment problems, fineness of fiber as an element in cotton quality, livestock direct marketing, auctions, and slaughtering, and insurance rates are given.

[Investigations in agricultural economics at the Ohio Station] (*Ohio Sta. Bimo. Bul. 195* (*1938*), *pp. 220–223*).—An article by C. W. Hauck on Distribution of Late-Crop Ohio Potatoes, 1936 and 1937, includes tables showing by years 1933–37 the average farm prices of potatoes in Ohio and the more important States shipping late potatoes into Ohio and the quantity of potatoes delivered at different places to buyers, and the different types of agencies handling potatoes directly from growers. The tables are based on reports from 479 growers in 1936 and 166 in 1937 in northeastern Ohio. The Index Numbers of Production, Prices, and Income, by J. I. Falconer (E. S. R., 80, p. 258) are brought down through August 1938.

Current Farm Economics, [December 1938] (*Oklahoma Sta., Cur. Farm Econ., 11* (*1938*), *No. 6, pp. 127–155, figs. 3*).—In addition to several tables of index numbers of farm prices and purchasing power, articles are included on the Agricultural Outlook for 1939, by agricultural economists of the station and the extension service (pp. 128–136); Some Aspects of Land Ownership in Texas County, by R. T. Klemme (pp. 136–146); and on Oklahoma Farm Population Changes in 1937, by O. D. Duncan (pp. 147–151).

Foreign Agriculture, [December 1938] (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr., 2* (*1938*), *No. 12, pp. 549–615*).—Included are Agriculture in the Anglo-American Trade Agreement, by H. L. Franklin (pp. 551–582), and Agriculture in the New Canadian Trade Agreement, by J. L. Stewart (pp. 583–615).

Low dairy production costs in New Zealand, G. J. Hucker (*Farm Res.* [*New York State Sta.*], *5* (*1939*), *No. 1, p. 13*).—The possibility of competition from New Zealand cheese is discussed.

Vegetative composition, density, grazing capacity and grazing land values in the Red Desert area, A. F. Vass and R. Lang. (Coop. U. S. D. A.). (*Wyoming Sta. Bul. 229* (*1938*), *pp. 72, figs. 3*).—The vegetative types in Sweetwater County and their approximate boundaries were determined. The amount of vegetation within sample plats, usually not more than 10 to the township, was determined using the square foot method of random sampling. Each species within the plat was identified and its density estimated. In addition, the number of living and dead plants and reproductions were counted for *Artemisia tridentata* (black sage), *Eurotia lanata* (winterfat), *Atriplex nuttallii* (Nuttall's salt sage or salt bush), and *A. confertifolia* (shadscale or spiny salt sage). A list of the 38 plant families quite commonly encountered showing the number of relatively common species is included, and the important genera and species of *Asteraceae*, *Chenopodiaceae*, *Poaceae*, and *Cyperaceae* are described. A list of the common flora of the county with notes as to the character, location, etc., is also included.

The Red Desert area, including approximately 6,732,000 acres, has an annual precipitation of about 10 in., and due to the lack of stock water in the summer is used almost exclusively as winter range for sheep. The vegetation is mainly desert shrubs with a small amount of grass scattered among the shrubs. The amount of living and dead plants and reproductions in the area studied tended to show that with the exception of a few areas reproductions were sufficient to replace plants dying in 1936. Grazing capacity varied considerably between the various vegetative types. The average capacity for Sweetwater County in 1936 was approximately 18.6 surface acres per sheep and 131.75 acres per cow for year-round grazing. Seven types composed 75 percent of the vegetation of the Red Desert, and 36 other types the other 25 percent. Of the area approximately 32 percent fell in the *Artemisia tridentata—Agropyron* (wheat grass) type, 11 percent in the *Artemisia tridentata-Atriplex confertifolia* type, and 7 percent in the *Sarcobatus vermiculatus* (greasewood)—*A. nuttallii* type. The respective grazing capacities of these three areas was 1.64, 1.87, and 1.22 surface acres per sheep month.

A comparison of controlled and uncontrolled grazing areas based on the *Artemisia tridentata—Agropyron* type showed no significant difference in grazing capacity.

"Based on economic studies of management practices and costs of sheep production, and long-time corrected prices for lambs and wool, the amount of investment per sheep unit may be $21 with the following distribution: Land, $10; buildings and improvements, $1.80; sheep, $6.65; other livestock, 50 ct.; machinery and equipment, $1.20; feed, supplies, and cash, 85 ct.; total investment, $21. The annual carrying costs of $3.90 on owned land may be divided as follows: Interest, $1.16; taxes, 31 ct.; repair and depreciation, 27 ct.; labor, $1.10; supplies, 50 ct.; shearing, 16 ct.; rams, 13 ct.; miscellaneous expenses, 27 ct. The production costs of $3.90 per sheep unit may be met by 23.9 lb. of lamb at $7.50 per hundredweight, 11 lb. of culled ewes at $3 per hundredweight, and 7.9 lb. of wool at 22½ ct. per pound. If production costs are 25 percent above normal, the price of lambs and wool should be increased 25 percent."

Types of farming in Iowa, II, C. L. Holmes and C. W. Crickman (*Iowa Sta. Bul. 374 (1938), pp. 161–248, figs. 51*).—This supersedes Bulletin 256 (E. S. R., 60, p. 884), and reports a study of the types of farming existing in 1932—previous to the effects of the droughts of 1933 and 1934 and the inauguration of the agricultural adjustment program under the direction of the Agricultural Adjustment Administration. The primary sources of information were published statistics, particularly the United States census of agriculture, and schedules of the township assessors filed with the Iowa State Department of Agriculture. Other information was obtained from detailed farm management surveys and farm accounting studies of the station, and from county agricultural agents and others having knowledge of the farming in different parts of the State. Maps and charts are included showing usually by townships the use of the lands of the State and the geographical distribution and trends in the production of different crops and kinds of livestock and livestock products. Other maps divide the State on the basis of the dominant cropping system and the dominant livestock system, and on the basis of the entire production program, i. e., type-of-farming areas. The State is divided into five type-of-farming areas—northeastern dairy, cash grain, western livestock, eastern livestock, and southern pasture. The cash-grain area and the southern-pasture area are each subdivided into two subareas, and an additional cash-grain area is also included in the western livestock area. The characteristics of the farming in the areas and subareas are described. The physical and economic factors and the personal situations and characteristics underlying the regionalization of types of farming in the State are discussed.

Economics of agricultural land use adjustments.—II, Socio-economic phases of soil conservation in the Tarkio Creek area, R. Schickele and J. P. Himmel (*Iowa Sta. Res. Bul. 241 (1938), pp. 353–408, fig. 1*).—This second bulletin of the series (E. S. R., 77, p. 552) reports the findings in a study, the purpose of which was to answer so far as possible the question "What are the main socio-economic forces which are obstructing the general adoption of soil conservation practices; in what direction and to what extent do they influence land use systems and ultimately the state of the land's productive capacity?" Farm survey schedules were obtained in 1935 from 253 farms in 8 representative sample blocks of 4 to 8 sections each in the Tarkio Creek watershed area of the Soil Conservation Service. These schedules (copy included in the appendix) included information on "(1) land use, crop acreages and yields for 1935, 1933, and 'normal' (5-yr. period preceding and including 1933); (2) the livestock system for 1935, 1933, and normal; (3) tenure status, lease provisions, mortgage indebtedness and taxes as of 1935, with some historical information on specific points; (4) conditions and value of buildings, and (5) family information, education, and social activities." All the farms were also rated according to five classes of topography and five classes of apparent erosion.

A comparison is made of farming conditions on a group of 25 farms each with the highest and lowest relative degrees of erosion. The effects of origin and age of farm operators, the "agricultural ladder", education and social activities, and housing on the attitude of farmers toward the land are also discussed. Some of the observations and conclusions in the study were:

The problem of conservation "is basically one of the people's attitude toward the land and that the various forces obstructing conservation have their roots in institutions and customs which grew out of the exploitive attitude characteristic of a pioneer economy."

The uncertainty of occupation and short-time interest in the land of tenants rather than tenancy, as such, is responsible for the exploitive land use by tenants. "This study reveals conclusively that the land on farms rented by relatives of the landlord is used practically in the same manner as that on owner-operated farms, in contrast to a considerably more exploitive system of land use found on the nonrelated tenant farms." The land on nonrelated tenant farms under stock-share leases showed a relatively conservative use-pattern very similar to that on owner and related tenant-operated farms. "The highest degree of soil exploitation is found on nonrelated tenant farms rented under crop-share leases, under conditions characterized by uncertainty of the prospective length of the tenant's occupancy and by short-time interest on the part of the tenant and sometimes even the landlord urging for the maximum immediate cash income with little regard for the future productive capacity of the land. . . .

"Fundamental improvements in the prevailing tenancy system must be made before a more general adoption of conservation practices on rented land can be expected to occur without substantial and continued public subsidies, and these improvements must lie in the direction of greater security of tenants' occupancy and stimulation of a long-time interest on the part of the tenant, in the productive capacity of the land, and in the farm as a place to live.

"The study discloses symptoms which point to the existence of a serious farm debt problem. The size of mortgages is out of line with the quality of the land, a result of overvaluation and overlending, particularly on the more rolling and less productive farms. With increasing mortgage load per acre a distinct tendency prevails for more corn, less grasses, and more erosion. On the one hand, the tremendous comparative advantage of corn in the area misled people to judge the value of a farm by the number of acres put into corn each year, regardless of whether the land could stand such heavy cropping over a long period of years. On the other hand, the highly encumbered farmers, particularly during the depression, were hampered in the long-time planning of conservational crop rotations and livestock programs and were led to maximize their acreages in cash crops under the pressure of high fixed obligations. . . . Readjustments in the farm debt structure designed to bring debt obligations more nearly in line with the producing power of the land under conservational systems of land use would facilitate the promotion of soil conservation practices. . . .

"Traditional farming systems, price relationships and their effect upon combinations of enterprises, and the still outstanding natural fertility of the land in the area studied, go far to explain the undisputable lack of soil conservation on farms that are operated by secure and unencumbered owners. Improvements in the tenure and credit systems will contribute to, but cannot solve alone, the problems of soil conservation."

Farm tenure in Iowa.—VI, Landlord-tenant relationships in southern Iowa, A. J. Englehorn. (Coop. U. S. D. A.). (*Iowa Sta. Bul. 372 (1938), pp. 65–93, fig. 1*).—This sixth bulletin in the series (E. S. R., 79, p. 697) shows how types of leases and tenure influence land use in southern Iowa. It is based on a study of 233 farms in four townships in four counties. The lease provisions and general practices in the area are described. Analysis is made of the relations of types and lengths of leases, size of farms, soil types, land use, length of occupancy by tenants, classes of landlords, etc. Some of the findings were as follows:

Of the leases, 70 percent were crop-share, 10 percent stock-share, and 20 percent cash, and 77 percent were for only 1 yr. Less than one-third of the stock-share leases were for 1 yr. only as compared with 80 percent each for the other types. Almost 50 percent of the land on rented farms was in pasture. Three-fifths of the cash leases were on farms of less than 100 acres. More than one-half of the stock-share, and two-fifths of the crop-share leases were on farms of 181 acres or more. Farms rented under stock-share and crop-share leases were generally located on the better types of soil, while the cash-rent farms were generally on the poorer soils The most conservative land use was on stock-share farms. The most exploitive use was on cash-rent farms, due largely to their small size, location on poor land, and frequent shift of tenants. Divisions of costs and proceeds on share-rent farms were rather uniform regardless of the size of farm or relative productivity of the soil. Compensation for unexhausted improvements was made only in exceptional cases.

Tenants had been on the present farm an average of 4.2 yr., but 71 percent had been on the farm less than 5 yr., and 22 percent less than 1 yr. Tenants remain longer on stock-share than cash-rent farms, and longer on cash-rent than crop-share farms.

From a standpoint of conservation, the best land use occurred on the farms of owners to whom the tenants were related, and the poorest on the farms of nonrelated landlords. On corporate-owned farms, the use was intermediate. The tenants had been tenant farmers for an average of 11 yr. Younger tenants looked forward to ownership, but older ones did not.

Land transfers in twelve counties in Nebraska, 1928–1933, L. F. Garey (*Nebraska Sta. Res. Bul. 107 (1938), pp. 24, figs. 10*).—Data were obtained chiefly from the records of the register of deeds in 12 counties scattered throughout the State. Six types of farming are represented. Some of the findings were as follows:

During the period 9,979 transfers involving 1,513,066 acres were made in the 12 counties. Of the acreage 63.8 percent was transferred by voluntary sales, 16.4 by distress transfers, and 19.8 by gift. The percentage by voluntary sales decreased from 70.62 in 1928 to 40.24 in 1933, while that by distress sales increased from 8.33 in 1928 to 25.6 in 1933 (1932–27.35 percent). The acres per transfer tended to increase during the period for all three types of transfers, the average for all transfers being 137 acres in 1928 and 164 acres in 1933. The average assessed values per acre during the period were $56.77 in the case of voluntary sales, $42.79 for distress transfers, and $60.32 for lands transferred by gift. The ratio of assessed to sales value of voluntary transfers was lowest where livestock contributed the major part of the income, except in the range livestock area where it was highest. It was generally high in the cash-grain and general-farming areas. The ratio was also higher for voluntary than for distress transfers, indicating that high taxes were not the major cause of distress transfers. The claims in distress transfers average 56 percent of the consideration received, being 67 percent in the counties with an average land value of over $75 per acre in 1930, and 50 percent in the counties where the average value was less than $75.

Of all the land in distress transfers 12 percent was grade 1, 42.8 percent grade 2, 10.8 percent grade 3, 16.3 percent grade 4, and 18.1 percent grade 5. This distribution was similar to the distribution of the five grades of land in the counties. Proportion of land in different grades and assessed value of buildings were important factors in the sales value in distress transfers. There was a tendency to overvalue grade 3 land, part of which was due to building value. In some counties there was a definite inclination to overbuild on poor grades of land.

The trend of real estate taxation in Kansas, 1910 to 1935, H. Howe (*Kansas Sta. Circ. 192 (1938), pp. 22, figs. 9*).—This is a continuation of the study previously noted (E. S. R., 54, p. 483). The more important summary tables and charts are repeated and data added for the years 1924–35, inclusive. The discussion is less detailed than that in the previous bulletin but is intended to meet the demands of persons interested primarily in summary statements. The parts deal with the trends of taxes on farm real estate and city real estate and compare the two trends.

The tax system of Nebraska with special reference to its relation to agriculture, L. B. Snyder (*Nebraska Sta. Res. Bul. 105 (1938), pp. 82, figs. 9*).—This bulletin deals chiefly with the assessment of tangible property, tax levies, receipts, and expenditures for State, county, school, and township purposes during the period 1927–32, and tax delinquency during the period 1928–32. It is based chiefly on detailed studies made for and in 12 representative counties, 4 of which operated under the supervisor system with township organizations and board of supervisors, and 8 under the precinct system with a county board of commissioners. The data for these counties are analyzed and presented in tables and charts.

The value of all tangible property in the State decreased from $3,141,000,000 in 1927 to $2,521,000,000 in 1932. About 57 percent was farm real estate, 20 percent city real estate, and the remainder personal property. Property-tax levies were greatly reduced in all taxing units from $63,914,948 in 1927 to $41,417,767 in 1933.

"School levies accounted for 45 to 84 percent of the total property tax for the 93 counties. About 20 percent was for counties and the same amount for cities and villages. Between 12 and 13 percent was for the State. The remainder was levied by townships. Of the total property tax levied in 27 supervisor counties, townships were responsible for from 5.27 to 9.87 percent of the tax. Combined county and township levies were about 25 percent of the total in supervisor counties and the county levies about 20 percent of the total in the six commissioner counties. Performance of the same functions required 5 percent more of the levy in supervisor counties than in commissioner counties."

With an allowance of a 1-yr. lag, the index of tax levies was found to fit fairly closely to the index of farmers' income and the index of purchasing power of Nebraska farm products. The combined per capita township and county levies were higher for supervisor counties than the county levies in commissioner counties.

State receipts ranged from $21,882,216 in 1928–29 to $28,140,849 in 1931–32. General property taxes supplied 41.73 percent of the receipts in 1927–28, and 20.63 percent in 1931–32, gasoline taxes 12.19 percent and 24.9 percent, respectively, in the 2 yr., and U. S. contributions 7.38 percent in 1928–29 and 22.12 percent in 1932–33. Of the county receipts in the 12 counties studied 67.53 percent came from taxes on tangible property in 1928, and 55.13 percent in 1933. Townships received 90 percent or more, and schools 87 percent or more, of their revenues from tangible property taxes. County and township receipts per capita were higher in the 4 supervisor counties than in the 4 nearby commissioner counties.

Total State expenditures were 8 percent higher in 1932–33 than in 1927–28. State highway expenditures increased 65 percent during the period, while those for education and State institutions under the board of control remained about the same. Expenditures for public schools were almost as great as those for all other governmental units. Highway expenditures by counties amounted to about 60 percent of the total county expenditures. Practically all township funds were spent on highways.

Cumulated back-tax delinquencies in 91 counties increased from a total of $187,976 in 1928 to $2,019,482 in 1932. The number of properties delinquent increased from 1,200 to 18,897.

Farm taxes and farm real estate transfers in Rhode Island, J. L. Tennant. (Coop. U. S. D. A. et al.). (*Rhode Island Sta. Bul. 269 (1938), pp. 24, figs. 5*).—Tables and charts are included showing tax and transfer data indicated in part by the following findings:

Farm taxes per acre increased from 33 ct. in 1890 to 53 ct. in 1913, and to $1.57 in 1937. The taxes per $100 assessed valuation were 67 ct., $1.06, and $1.53, respectively, in the 3 yr. The 1934 taxes per acre on 227 farms were 49 ct. or less on 19 percent of the farms, 50 to 99 ct. on 24 percent, $1 to $1.99 on 24 percent, $2 to $2.99 on 15 percent, and $3 or more on 18 percent. The percentage of the taxes uncollected at the end of the year in which they were assessed rose from 15 percent in 1928 to 23 percent in 1934 and then dropped to 20 percent in 1935. In 5 of the 8 yr. less than 5 percent were uncollected at the end of the year in a few municipalities, but in one or more municipalities over 35 percent were uncollected at the end of each year. In 30 municipalities over 8 percent of the taxes due 2 yr. previously, and nearly 3 percent of those due 3 yr. previously, remained uncollected. In 1936 the percentages of taxes assessed 2 yr. previously that were uncollected ranged from less than 2 percent in 4 municipalities to over 10 percent in 12 municipalities. The number of transfers of acreage property per town rose irregularly from 9.4 in 1900 to 22.8 in 1921, varied from 15.8 to 19.6 per year in 1922–32, and dropped to 13.4 in 1933. About three-fourths of the transfers were properties with buildings. These properties averaged larger in size and had a considerably higher assessed value per acre than properties without buildings. Warranty deeds were used for 76 percent of the transfers and quit claim deeds for 17 percent. Voluntary sales constituted 94 percent of the transfers from 1900–1935, distress sales 3.3 percent, and gifts 2.7 percent. The average acreage per farm transferred decreased from 1900 to 1930.

Geographic distribution of Arkansas crops and livestock, J. W. Reid (*Arkansas Sta. Bul. 367 (1938), pp. 36, figs. 29, maps 2*).—This graphic bulletin includes maps, with explanatory text, showing by counties, usually, the topography; soils; soil types; soil erosion; precipitation; frost-free dates; percentages of land in crops, in farms, and not in farms; acreages of crop land idle; acreages of different field crops; pasture; different fruits and vegetables; and numbers of different types of livestock. The data for crops, land use, and livestock were obtained from unpublished material of the United States agricultural census, 1935.

The Arizona grapefruit industry: Some economic aspects, G. W. Barr (*Arizona Sta. Bul. 161 (1938), pp. 219–244, figs. 8*).—This study was made to clarify the problems facing Arizona producers of grapefruit in 1938. The present production and the future production to 1943 with present plantings in the different areas of the United States and the markets for the different areas are discussed. Other subjects deal with the importance of world trade, grapefruit competitors, the disposition and consumption of grapefruit, prices, transportation rates, increase in the use of grapefruit, and the relation of costs to consumption.

Some of the findings brought out are: The grapefruit acreage in Arizona increased from about 1,000 acres in 1923 to 15,000 acres in 1937, about 50 percent of the increase being plantings in 1931–33, inclusive. The average yield (1925–36) per mature tree in Arizona was 13 tons per acre as compared with 8 tons in Florida, 6 in California, and a little over 5 in Texas. The returns to Arizona growers were more than $70 per ton of fruit on the trees in the years 1925–28, inclusive, but not more than $6 in 1937–38. Auction prices for grapefruit in cities in 1937–38 were three-eighths to one-half less than in 1925–28. On the basis of the probable number of trees on a full bearing basis, it is estimated that the southwest must plan to market at least 50 percent more Desert area grapefruit by 1943 than was available for marketing in 1938. The probable increase for the United States in mainland production is estimated at 15 to 20 percent. Net exports of grapefruit from the continental United States amounted to about 4 or 5 percent of the production in 1937–38. Removal of 56,000 acres of trees in the continental United States would be adequate to keep the production in the period beginning about 1943 from greatly exceeding the average of the year 1935–36. The removal of about 400,000 tons of fruit annually would reduce the average marketing to that of 1935–36. Price reductions have been accompanied by increased consumption, but in the 9 yr. prior to 1938 when consumption increased approximately as rapidly as production, the reduction in prices was assumed by the producers. Consumption of grapefruit per capita in America approximately doubled in the 12-yr. period ending with 1937. Approximately 50 percent of the crop was processed in 1937–38.

The egg-drying industry in the United States, W. D. Termohlen and E. L. and C. C. Warren (*U. S. Dept. Agr., Agr. Adjust. Admin., Market. Inform. Ser., 1938, PSM-1, pp. II+80, figs. 19*).—This bulletin describes and discusses the development of the domestic and foreign egg-drying industry, the available facilities in the United States for drying egg products, the factors influencing imports, the costs of production of dried-egg products in the United States, the competition between dried eggs and frozen or shell eggs, and the uses for dried eggs. Appendixes include a bibliography on the dried-egg products and an annotated list of patents concerning the drying of eggs.

Cotton sold in the seed in the United States, L. D. Howell (Coop. Okla., Ark., Mo., and Tenn. Expt. Stas.). (*U. S. Dept. Agr., Tech. Bul. 662 (1938), pp. 24, figs. 2*).—This bulletin discusses the practice of selling cotton in the seed, on the basis of data collected for the seasons 1928–29 to 1932–33, inclusive, for selected markets in Tennessee, Arkansas, Missouri, and Oklahoma, in which part of the cotton was sold in the seed and part was custom-ginned.

Most of the cotton produced in the United States is custom-ginned, but remnants sold as seed cotton aggregate a considerable number of bales. Other cotton sold in seed constitutes a substantial proportion of the cotton produced in some districts, particularly in the northern part of the Cotton Belt. In the districts studied, lots sold in the seed varied from 100 lb. to 10,000 lb., less than half of the lots being less than bale size, 28 percent about bale size, and 23 percent larger than bale size. Cotton sold in the seed averaged lower in grade and longer in staple than custom-ginned cotton. Lint-equivalent prices for cotton in the seed during the 5 yr. averaged about the same as the prices for custom-ginned cotton. Average central-market prices on the basis of grade and staple were about the same. Turn-out of lint cotton per 100 lb. of seed cotton averaged about 2 lb. less for cotton sold in the seed and sold in the same market on the same day. Prices to growers for cotton sold in the seed showed little relationship between differences in average lint-equivalent prices from market to market and the differences in average central-market values of cotton on the basis of grade and staple length, with the result that little reward was offered on a community basis for improving the quality of cotton sold in the seed. A number of other advantages and disadvantages to growers and ginners are discussed.

Marketing Iowa cantaloupes, A. T. Erwin, G. Shepherd, and N. D. Morgan (*Iowa Sta. Bul. 373 (1938), pp. 97–158, figs. 20*).—This bulletin describes and discusses the problems in the growing and marketing of cantaloups in Iowa, and suggests possible methods of meeting these problems. It is based on records of the Muscatine Island Field Station, information obtained from growers, truck peddlers, and commission merchants, and Federal market reports and statistics. Sections of the bulletin deal with cantaloup production in the United States and Iowa; competition between regions; the soils, temperatures, length of growing season, growing practices, disease, insect, and wind damages, etc., in the Muscatine district of Iowa; quality of home-grown and shipped-in melons; external indicators of maturity; varietal and temperature factors; prices; marketing and transportation problems; grading, branding, and crating; the peddler buyer and his effect on prices and quality; different types of market; the market for frozen melons; and cooperative marketing.

Community livestock auctions in Iowa, S. H. Thompson and K. Bjorka. (Coop. U. S. D. A.). (*Iowa Sta. Bul. 376 (1938), pp. 273–343, figs. 14*).—This bulletin traces the development of community livestock auctions in Iowa; discusses the economic conditions leading up to their establishment and present status as to numbers, location, relation to other marketing agencies, and volume and character of business handled; describes and discusses the nature of the organization of auctions and their methods of operation; and points out some of the possibilities and limitations of auctions as marketing agencies for livestock. Public regulation and supervision of the auctions is also discussed. Data regarding the development, organization, and operation of 48 auctions were obtained from the operators by personal visits. Data as to the number of animals of different classes and species sold and bought at different types of markets in 1936 and other information on the auctions were obtained from 1,597 farmers by mail and personal visits.

The number of auctions in operation in Iowa increased from 1 in 1904 to 25 in 1929, to 50 in 1932, and to 195 in 1936. The number in 1936 in the 5 type-of-farming areas of the State varied from 62 in the western livestock area to 26 in the northeastern dairy area. Cattle and calves were sold at auctions in larger numbers than hogs and sheep. Farmers consigned 64 percent of the cattle, 73 percent of the hogs, and 84 percent of the sheep sold in 1936 at the 48 auctions studied. Dealers consigned the most of the balances.

Of the cattle and calves sold, farmers purchased 46 percent, dealers 46 percent, and packers 8 percent. Farmers purchased most of the stockers, feeders, and breeding animals. Farmers purchased 68 percent of the hogs and 50 percent of the sheep and lambs, dealers 30 and 47 percent, respectively, and packers 2 and 3 percent, respectively. Selling charges at 44 of the auctions were on the basis of a percentage of the gross sales, the most common commission rate being 3 percent. The other four auctions used a specific rate per head. In comparison with conveniently located public stockyards, the expense of selling at the auctions was relatively less where a small number of animals of low value were involved, and relatively more where a large number of animals of high value were marketed.

Survey of the New Orleans livestock market since 1925, J. M. Baker (*Louisiana Sta. Bul. 300 (1938), pp. 36, figs. 12*).—The livestock dealers' organizations, their functions, regulations, charges, etc., are briefly described. Tables and charts are included and discussed showing for the New Orleans market for the period 1928–37 or longer the annual receipts of cattle, calves, and hogs from different States; and the average monthly prices of different grades of steers and calves and corn-fed and feeder hogs. Similar but less detailed data are included in the text for sheep, lambs, and goats. The relative purchasing power of choice steers and corn-fed hogs in different years is illustrated. The trends in receipts of cattle at New Orleans and other markets and the average prices of steers, calves, and hogs are compared for the period 1925–37.

RURAL SOCIOLOGY

Personality of individuals and the rural community pattern, R. L. Schanck (*Rural Sociol., 3 (1938), No. 2, pp. 159–171*).—In this article a technic called cluster-bloc analysis is used to discover patterns of personality traits common in individuals of a rural community. Several significant gross patterns are discovered, but refinement indicates the essential uniqueness of personality in the degree that it is a synthesis of many attributes. The two most significant patterns might be called strong and weak patterns. The strong pattern is characterized by ascendancy, drive, expansiveness, and social participation. The weak pattern lacks these qualities. Differences in intelligence and socialization divide these large groups into smaller blocks. The role of the different blocks in the community is indicated.

New sources of vitality for the people, H. W. Odum. (Univ. N. C.). (*Jour. Amer. Dietet. Assoc., 14 (1938), No. 6, pp. 417–423*).—The subject of living conditions in the South is divided into three main topics—the present situation, which the author characterizes as a new realism of the people, the superabundance of children and young people for whom a greater supply of physical and nutritional vitality must be provided, and the measures of deficiency in the sources of vitality. It is pointed out that any program which will increase the supply of vitamin-containing foods and balance agricultural production must automatically contribute to the conservation and enrichment of the soil and of a diversified farming, thereby minimizing the existing enslavement to cotton economy.

The people of Arizona irrigated areas, E. D. Tetreau. (Ariz. Expt. Sta., U. S. D. A., et al.). (*Rural Sociol., 3 (1938), No. 2, pp. 177–187*).—The author found that all but about 32 percent of the rural people on Arizona irrigated areas learned their ways of living and of farming in the Dust Bowl, the Western Cotton Belt, the Old South, and Mexico. Of the remainder, less than one-half are native Arizonians. Influences of rural ways of living in other regions are still predominant in Arizona rural life. Almost one-half of the heads of rural households were unskilled laborers, the greater part being laborers on farms.

The author thinks that policies for agriculture should be made in the light of their probable effect upon the numerical strength of the various classes of workers. Net gains among upper-level occupations and somewhat smaller net losses among occupations of the lower levels marked the 7-yr. period 1929–36. A considerable shift from urban centers to the open country took place. Proportionately greater numbers of children away from home were drawn from upper-level than lower-level occupations. Normal families predominated among all households, especially among unskilled laborers. Mexican women, as compared with other nativity and racial groups, had the largest completed families.

Significance of varying population densities and regional development in the ecology of Kansas, R. L. Roberts (*Rural Sociol., 3 (1938), No. 2, pp. 145–152, fig. 1*).—The westward surge and rebound of immigrants to Kansas in the last half of the nineteenth century was followed by constant shifts of population from higher to lower density areas, and from rigorous pioneer activities to the more convenient and less strenuous life in the settled regions which were due in large part to the effect of the topography, climate, rainfall, and natural vegetation in the three demographic subregions within the State. Successive stages of community development, as well as varied cultures and different occupational and personality types, have accompanied these population shifts from region to region.

International co-operation on labor problems in agriculture: The first meeting of the Permanent Agricultural Committee of the International Labor Organization, L. Nelson. (Minn. Expt. Sta.). (*Rural Sociol., 3 (1938), No. 2, pp. 195–199*).—The author gives a brief account of the first meeting held at Genève (Geneva), Switzerland, from February 7–15, 1938.

The problem of stabilizing the migrant farm laborer of California, M. R. Benedict. (Univ. Calif.). (*Rural Sociol., 3 (1938), No. 2, pp. 188–194*).—Approximately half the farm labor force used in California agriculture consists of people who do not have a continuous relationship with a particular farm, and their low incomes are in large measure a result of very brief and intermittent periods of employment. This intermittency arises from two factors—(1) very marked variations in the need for labor and (2) excessive competition for jobs and in some cases variations in labor supply which have no very specific relation to the conditions and requirements of the farms of the State. The findings of Adams (E. S. R., 80, p. 262) are discussed.

As remedies the author suggests (1) the necessity for better and more continuous knowledge of the labor needs and the labor supply, (2) the development of a satisfactory procedure for maintaining continuous information with respect to amounts of labor available, (3) the development of the possibilities of adjusting California agriculture to a basis providing a more uniform labor load, (4) the means for meeting the most extreme peak demands without having to maintain so large a number of casual workers, (5) the finding of means to withdraw from the agricultural labor market certain numbers of workers not needed at any time of year or unsuited to this kind of work, and (6) better coordination of seasonal work in agriculture with that in other industries.

Types of migratory farm laborers and their movement into the Yakima Valley, Washington, R. Wakefield and P. H. Landis. (Wash. Expt. Sta. et al.). (*Rural Sociol., 3 (1938), No. 2, pp. 133–144, figs. 3*).—The highly seasonal nature of Yakima Valley agriculture requires much transient labor, especially during the months of September and October. The workers involved in the seasonal influx include immigrants from the drought States, "bindle tramps," migratory family workers, and casual agricultural workers. While most of the migratory workers have no fixed pattern of migration, large numbers of them follow one of several definite movements. Many of the casual workers come from the nearby cities and stay only during the harvest season; some travel coastwise following the seasons from California to Washington; others follow shorter routes which are confined to the Northwest. The drought refugees usually come directly into the Valley and scatter over the State when the working season closes.

Relief data as criteria of submarginality, P. H. Landis. (Wash. Expt. Sta.). (*Jour. Farm Econ., 20 (1938), No. 2, pp. 488–494*).—The general hypothesis is that relief data may be used profitably (1) as criteria of submarginal land areas, (2) to locate persons who are submarginal economically because of insufficient capital or equipment or skill in farm management, and (3) as criteria of the culturally submarginal man in the agricultural enterprise. The development of the rural relief group as a permanent submarginal class is deemed the most serious threat to rural democracy that exists today, for it may well be that the continuance of public relief in rural communities will make for social stratification, not previously existing, on the basis of self-sufficiency v. dependency.

Relief in rural Iowa, R. E. Wakeley and A. H. Anderson (*Iowa Sta. Bul. 377 (1938), pp. 345–388, figs. 13*).—That relief is a major problem in Iowa is indicated by a nine-county summary for the 5-yr. period 1932–36.

One in 10 families in the counties surveyed was on relief in 1936, exclusive of W. P. A. employment. The relief population is composed of many diverse types of people. They have been reduced to relief status by a wide variety of factors, and they remain on relief for widely different lengths of time. Relief increased steadily from 1920 to 1932, then rose more sharply in response to depressed conditions in agriculture and industry. Changes in relief lag behind changes in general economic conditions. An important factor in its extent was the availability of Federal and State aid to supplement inadequate local relief funds. Relief will remain a major problem in Iowa for at least a generation, as it can be overcome only by the operation of long-time economic and social changes. It will require not only increased care of the aged needy but also the combined efforts of local, State, and National agencies to educate adults, to guide youth, and to see that it will not further increase unemployment and relief.

Unemployment relief, not counting W. P. A. cases, decreased nearly one-third from October 1936 to October 1937; the number of county care cases did not change materially; and persons receiving old-age assistance increased approximately 40 percent. As a result the total number of families receiving assistance from these three agencies was slightly larger in October 1937 than in October 1936. Further large increases are not expected, and there is some tendency for the total relief load to fluctuate narrowly around the present level.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Practical agriculture for high schools, D. C. McIntosh and D. M. Orr (*New York: Amer. Book Co., [1937], pp. X+518, [figs. 228]*).—The authors of this textbook "consider the economic viewpoint the best approach to the study of agriculture. The relation of the economic factors to the technical, scientific, and practical phases of agriculture forms the basis for most of the discussions in this volume. While first consideration is given to those engaged in agriculture as a vocation, information of interest to those in other industries is presented by discussions, charts, graphs, tables, maps, and pictures." The several chapters deal with the following subjects: Some factors affecting agriculture, agricultural resources, planning the farm program, agriculture during periods of depression, marketing farm products, soil conservation and improvement, cultural practices and crop rotation, small grains, corn, weeds and their control, cotton, potatoes and tomatoes, fruit growing, legumes, the sorghums, animal improvement, dairying, beef cattle, poultry, swine, sheep, horses and mules, meat selection, and rural social and economic adjustment. Each chapter is followed by exercises and references.

FOODS—HUMAN NUTRITION

Foods, production, marketing, consumption, J. J. Stewart (*New York: Prentice-Hall, 1938, pp. XVI+737, figs. 76*).—The nature of food problems and the food needs of the individual, the family, and the nation are discussed in 4 of the 13 chapters contained in this book. The other chapters deal with the carbohydrate foods, fresh fruits and vegetables, fats and oils, dairy products, meat and fish, poultry and eggs, beverages, and the preservation of food. The appendix contains information on the per capita consumption of foodstuffs in the United States since 1887 and the approximate shipping season of fresh vegetables and fruits by States of origin; buying guides for fresh vegetables and fruits; definitions for various grades of milk; personal health data; data useful in cooking; patterns for meal planning; score cards for foods and service; and rules for table service. Sources of information on food problems are listed in the bibliographies which complete each chapter.

Biochemistry for medical, dental, and college students, B. Harrow (*Philadelphia and London: W. B. Saunders Co., 1938, pp. 383, figs. 52*).—The latest developments in the field of animal biochemistry are contained in this textbook. One of the 24 chapters is devoted to a discussion of the biochemical aspects of the nervous system and another to the hormones in connection with the glands which manufacture them. The appendix contains tabular data on the nutritive value of foods.

Foods and nutrition [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1938, pp. 8–10*).—Included in this annual report (E. S. R., 78, p. 719) are summaries of studies dealing with human requirements for vitamin A as determined with the Hecht adaptometer, variations in the ascorbic acid content of different brands of commercially canned tomatoes and tomato juice, the effect of storage at different temperatures and for different periods of time on the ascorbic acid content of home-canned tomatoes, commercially canned tomato juice, and fresh orange juice, and losses in vitamin A and vitamin B_1 in carrots and spinach, both raw and cooked; the tolerance of experimental animals to vanadium and the effects of toxic doses; the relative richness of cabbage, lettuce, and spinach in total calcium, phosphorus, and iron as shown in data compiled from the literature; the quality of angel food cakes made with thin, normal, and thick egg whites; the influence of the consistency of fats on shortening value; the effect of various factors on table quality of potatoes; and the selection of varieties of green vegetable soybeans for cooking quality.

Human conservation and nutrition, H. K. Stiebeling (*Plan Age, 4 (1938), No. 10, pp. 279–291*).—In this article, which is based on a paper delivered at a conference on the conservation and development of human resources, the author discusses the nutritive requirements of the body, the nutritive values of food, and food consumption habits in the United States. Included in the discussion are the allowances per adult man for the more important nutrients as adopted by the Technical Commission on Nutrition of the League of Nations and similar allowances per nutrition requirement unit adopted by the U. S. D. A. Bureau of Home Economics to classify diets as good and poor.

Nutrition and soil conservation, D. E. LILIENTHAL (*Jour. Amer. Dietet. Assoc., 14 (1938), No. 6, pp. 424–430*).—The relationship between the nutritional status of the people and that of the soil is discussed, particularly in regard to phosphate deficiency in humans and animals and the program of the Tennessee Valley Authority on the conservation of the soil phosphates.

Some public health aspects of food, J. E. FULLER. (Mass. Expt. Sta.). (*Jour. Amer. Dietet. Assoc., 14 (1938), No. 6, pp. 412–416*).—The author discusses the relationship of food to ptomaine and food poisoning, botulism, and undulant fever and the methods of control. The bibliography contains 11 references.

Table of composition of foods (*Imp. Bur. Anim. Nutr. [Aberdeen], Tech. Commun. 10 (1938), pp. 14*).—This table, which has been compiled for use in the analysis of dietary surveys, gives the energy value and the protein, fat, carbohydrate, calcium, phosphorus, and iron content of about 300 foods commonly used in Great Britain. Data from available publications have been supplemented with hitherto unpublished data supplied by manufacturers of certain proprietary foods and by analyses furnished by H. E. Magee or made at the Rowett Research Institute.

In the foreword the opinion is expressed that the importance of the variation in the composition of any given food, as determined by different workers and by the same worker on different samples of the same food, is for the most part insignificant in comparison with the differences in the average composition of diets of different social groups as calculated from any one table. However, it is considered probable that changes have taken place in recent years in the composition of beef and pork as a result of changes in the practice of animal husbandry. This has been taken into account in the selection of values for the protein and fat of beef. Iron is reported both as total and as available (ionizable). Where no actual determinations have been recorded for particular foods the percentage of iron in the available form for the class of foods to which they belong has been applied and in some instances assessments based upon the known composition of similar foods have been made for other constituents. In the calculation of energy values the factors 4.1, 4.1, and 9.3 have been used for the protein, carbohydrate, and fat content, respectively. The figures reported for percentage waste represent only inedible material and are derived in part from published data and in part from values secured in intensive dietary surveys.

Effect of exterior temperature upon press fluid, shear force, and cooking losses of roasted beef and pork muscles, A. M. CHILD and M. J. SATORIUS. (Minn. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 11, pp. 865–871, fig. 1*).—In continuation of previous studies (E. S. R., 74, p. 874), the authors tested 48 bottom-round (semitendinosus muscle) roasts and 72 standing-rib (longissimus dorsi muscle) roasts of beef and 48 center-loin (longissimus dorsi muscle) roasts of pork. The semitendinosus beef muscle cooked to an internal temperature of 58° C. at oven temperatures of 125°, 150°, 175°, and 200° did not differ in press fluid or shear force. The cooking loss due to evaporation increased with increasing oven temperature. The longissimus dorsi beef muscle cooked to an internal temperature of 58° at constant oven temperatures of 150° and 200°, and at 150° following 20 min. of searing at 260° did not differ in press fluid or shear force, but a significantly greater number of pounds of force were required to shear the roasts heated at 200° than those heated at 150°. The cooking losses were greater at 200° and at 150° following searing than at 150° constant oven temperature. The longissimus dorsi pork muscle cooked to an internal temperature of 84° at constant oven temperatures of 125°, 150°, and 175°, and at 150° following searing at 200° did not differ in press fluid or shear force except that less force was required to shear the roasts cooked at 125° than those cooked at 150°. The cooking losses were not affected by exterior temperature.

The physical and chemical characteristics of lards and other fats in relation to their culinary value.—I, Shortening value in pastry and cookies, B. Lowe, P. M. Nelson, and J. H. Buchanan (*Iowa Sta. Res. Bul. 242 (1938), pp. 52*).—The shortening values of lots of leaf and back lard from individual pigs, of composite lards from groups of pigs receiving different feeds, and of commercial lards, hydrogenated fats, corn oils, and butter were compared in pastries and in cookies. The other ingredients were all-purpose flour, salt, and water in the pastries, together with granulated sugar, frozen egg yolks, and fresh eggs in the cookies. An electric mixer was used, and the products were baked in a gas oven. The manipulative and technic procedures were varied in different series of tests, and the effect upon the breaking strength of the products was measured with the Bailey shortometer.

The relative shortening values of the various fats, according to the increase in breaking strength of the pastries, were as follows: Oils, lards, hydrogenated fats, and butter. The lards gave the best product as judged by flakiness, flavor, shortening value, and economy. The oils produced a mealy, less flaky pastry, but by modifying the technic a flaky pastry could be obtained. The shortening values, arranged in increasing baking strength of the eggless cookies, were as follows: Prime-steam lard, hydrogenated fats and open-kettle lard, oils, and butter. The breaking strength of the cookies made with the oils was about four times as great, from the lards about three times, and from the hydrogenated fats and butter about twice as great as that of pastries made with these fats. The egg yolk cookies made with the oils and butter had the greatest breaking strength, with the other fats ranging about the same as in pastry. The breaking strengths of the whole egg cookies were fairly uniform, the lards being slightly superior to the oils.

The breaking strength of the pastry was increased when a longer time was allowed for combining the water with the flour and the dough or the baked product was not aged longer than 2–3 hr., and was markedly decreased when the fat and flour were overmixed and the dough or pastry was left standing overnight. Pastries with lower breaking strengths were also produced when hard and soft lards were combined in the formula, part of the lard was replaced by oleic acid, or the lard was at room temperature at time of mixing.

The place of milk in nutrition, C. A. Elvehjem. (Univ. Wis.). (*Milk Dealer, 28 (1938), No. 1, pp. 56, 58, 60, 62*).—The author reviews some of the more recent findings concerning the importance of milk in human nutrition, particularly the differences in nutritive value between raw and pasteurized and summer and winter milks.

Advantages of adding apple to milk formulas, F. J. Reithel and I. A. Manville (*Amer. Jour. Diseases Children, 56 (1938), No. 2, pp. 235–238, figs. 3*).—The results of chemical tests are presented to show that the addition of 4, 5, and 6 percent dehydrated apple to whole cow's milk used in infant feeding lowered the pH from 6.5 to 5.7 and produced a soft flocculent curd.

A study of protein extract from soybeans with reference to its use in food, S. Woodruff, E. Chambers, and H. Klaas. (Ill. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *57* (*1938*), *No. 10*, *pp. 737–746*, *pls. 2*).—The protein substance was extracted from two varieties of mature soybeans and from commercial soybean flakes by treating the fat-free ground beans with water at room temperature and precipitating the protein from the extract by acidification with acetic acid to pH 5.0. The yield amounted to about 52.6 percent of the nitrogen content of the fat-free soybeans. The protein equivalent of the nitrogen percentage, using the factor 5.71, was 92 percent. The protein substance appeared to be anisotropic, not measurably soluble in water or salt solution, tasteless, odorless, incapable of producing a foam when suspended in water, and possessed no thickening or binding powers similar to the egg proteins in custard or muffins.

Maraschino cherries have many uses, F. A. Lee (*Farm Res.* [*New York State Sta.*], *5* (*1939*), *No. 1*, *pp. 6, 11*).—Brief suggestions are given as to the selection of cherries for canning fruit salad and preparing maraschino cherries in the home.

Variations in mineral food analyses, A. H. Word and G. Wakeham (*Colo. Univ. Studies*, *25* (*1938*), *No. 3*, *pp. 181–194*).—The authors have classified 68 different foods according to the mineral content as determined by about 50 groups of investigators. Variations of 25 percent or less were found in the phosphorus content of 17, the calcium of 12, and the sulfur and iron of 11 foods; of from 26 to 200 percent in the phosphorus of 26, the calcium of 22, and the sulfur and iron of 20; and of over 200 percent in the iron of 41, the calcium of 21, the phosphorus of 12, and the sulfur content of 11 foods. It is suggested that the apparent discrepancies are due in part to such factors as differences in soil, climate, methods of culture, and the use of fertilizers. Other factors may be varietal differences and variations within varieties, and in the case of trace elements such as iron, the extremely small quantity contained in most foods.

The distribution of copper in certain tissues of normal and anemic albino rats, H. Gibbon and G. Wakeham (*Colo. Univ. Studies*, *25* (*1938*), *No. 3*, *pp. 173–179*).—Using the technic described in a previous study (E. S. R., 76, p. 723), the authors determined the copper content of the blood, liver, skeletal muscle, heart, and kidney of normal and anemic rats.

The blood copper decreased to the greatest extent as the anemia developed, the liver copper following but to a much less extent, while the skeletal muscle content increased and the copper in the kidney, heart, and spleen remained almost unchanged until a severe degree of anemia had been reached. In 7 anemic rats the percentage of hemoglobin ranged from 17.8 to 40, the erythrocytes from 0.54 to 2.94 million per cubic millimeter (6 rats), the blood copper from a trace to 1.3 mg per 100 g, the liver from 0.098 to 0.356, the spleen from 0.019 to 1.28, the heart from 0.113 to 0.978 (6 rats), the muscle from 0.101 to 0.768 (6 rats), and the kidney copper from 0.187 to 0.522 mg per 100 g of tissue (6 rats). In 5 normal rats the percentage hemoglobin was between 112.1 and 124.6 and the blood copper from 0.181 to 0.445, and the other values obtained were liver copper from 0.235 to 0.592, spleen from 0.339 to 0.56 (4 rats), heart from 0.345 to 0.917, muscle from 0.174 to 0.342, and kidney copper from 0.351 to 0.567 mg per 100 g of tissue (4 rats). The data indicate the presence of a closer relationship between the blood copper and the tissue copper than between hemoglobin and the tissue copper.

Growth, reproduction, and blood changes produced in rats by means of zinc carbonate, W. R. Sutton and V. E. Nelson (*Iowa Acad. Sci. Proc., 44 (1937), pp. 117–121*).—Essentially noted from another source (E. S. R., 78, p. 725).

Effect of addition of calcium on the biological value of the proteins of Indian diets, V. Ranganathan and Y. V. S. Rau (*Nature [London], 142 (1938), No. 3586, p. 165*).—In this preliminary note data are presented showing that the biological value of proteins may be affected by the calcium content of the diet. A typical Madras diet, with rice as the major item and a calcium content of 0.124 percent, gave a protein biological value of 44 percent and a digestibility value of 64 percent, while the same diet with the addition of 2 percent calcium carbonate gave corresponding values of 76 and 89 percent, respectively. It is thought that the lower biological value of the protein in the first instance may have been due to the nonavailability of the calcium of the diet.

New observations on the effects of calcium deprivation, D. M. Greenberg, M. D. D. Boelter, and B. W. Knopf. (Univ. Calif.). (*Science, 89 (1939), No. 2297, p. 18*).—The authors describe a severe neurological disturbance which they have observed in growing rats maintained on diets furnishing only from 0.01 to 0.02 percent of calcium. The condition is said to be the best demonstrated by subjecting the depleted experimental animals to short and mild galvanic shocks from an induction coil, but may develop spontaneously in animals still further depleted. The deficient animals have a very low blood calcium, from 4.4 to 6.6 mg per 100 cc of serum. The bony skeleton may be almost completely decalcified but the teeth show little decalcification.

Some nutritional problems of childhood, L. G. Parsons (*Brit. Med. Jour., No. 4061 (1938), pp. 929–933*).—In this lecture the author chooses celiac disease as a text because the defective absorption in this disease gives rise to various conditioned deficiency diseases which must be considered in the dietary treatment. Particular attention is called to rickets, anemia, and disordered carbohydrate and fat metabolism in celiac disease.

Effect of a milk supplement on the physical status of institutional children, I–III (*Amer. Jour. Diseases Children, 56 (1938), Nos. 2, pp. 287–300, figs. 4; 3, pp. 494–509, figs. 2; 4, pp. 805–823, figs. 2*).—Three papers are here included.

I. *Growth in height and in weight*, L. J. Roberts, R. Blair, B. Lenning, and M. Scott.—The growth records of three groups, each consisting of 36 children matched as to age, sex, deviation from average weight for height and age, and condition of the teeth were compared over a 12-mo. period. One group received in addition to the regular diet a pint equivalent daily of nonirradiated evaporated milk, the second received an equal amount of irradiated evaporated milk, and the remaining group served as control subjects, with no milk supplement. The children's physical status was followed by monthly measurements of height and weight and at the beginning and end of the year by the application of the Franzen indexes of nutrition, the Lucas-Pryor-Stolz width-length index, roentgenograms of the wrists, and dental and medical examinations. The diet of one child was studied quantitatively each week. By all methods of comparison the growth of the children receiving the milk supplements exceeded that of the control group, with the excess in mean gain in height averaging 0.9 cm for both milk groups and in weight 1.03 kg for the plain milk and 0.62 kg for the D milk group. The expected gain in height was not reached by 33 percent of the milk, 31 of the D milk, and 39 percent of the control group and 30, 25, and 42 percent, respectively, gained less than the expected weight. When the gains of the individual children in 24 matched trios were compared, the weight gains of the milk group were best in 46 percent, of the D milk group in 42, and of the control group in 12 percent of the trios. The height gains were in the same order but were less marked. Differences in actual consumption of milk by the milk groups is suggested as an explanation for the slightly more favorable results obtained for the plain milk group.

II. *Ossification of the bones of the wrist*, V. MacNair and L. J. Roberts.—The osseous development was followed by roentgenograms taken at the beginning and end of the experimental year on 37 children in the plain milk group, 36 in the D milk group, and 35 in the control group. Seventy-two children were matched in trios according to the stage of ossification of the wrist bone, as determined by the Flory inspectional age scale, the Carter index or ossification ratio, and the chronological age. By every method of comparison the children receiving the milk supplement showed greater progress in osseous development than did the control group. Approximately 50 percent of the milk group and 46 percent of the D milk group as compared to 17 percent of the control group showed a more favorable relation to the Carter standard for age at the end than at the beginning of the study. In the matched trios the child given plain milk made the greatest total gain in 44 percent, the child given D milk in 35 percent, and the control child in 21 percent of the comparisons. The mean advantage of the children in the milk group was 2.7 points, which is a statistically significant difference, amounting in terms of growth to over one third of the year's quota of expected gain in osseous development. The results obtained on the entire group confirmed those for the matched trios.

III. *Progress of dental caries*, L. J. Roberts, S. Englebrecht, R. Blair, W. Williams, and M. Scott.—Dental examinations were made on the teeth of 106 children remaining in the institution to the end of the experimental year. A seven-point rating scale was devised for expressing the degree of decay numerically. Roentgenograms were made of all teeth in the first examination and were checked against the dentist's findings. The children were divided into 30 matched trios on the basis of age, sex, and whether they were relatively immune or had a moderate or an extreme degree of caries when the study began. The group receiving the plain milk supplement had an average of 8.3 decayed teeth and 12 cavities per child as compared to 8.8 and 12.2, respectively, for the D milk group and 8.7 and 11.7, respectively, for the control group. The caries scale, which represents the total size of all cavities, was 878, 802, and 817, respectively, for the three groups. At the end of the year the average increase in number of carious teeth was 2.1 for the milk, 1.9 for D milk, and 2.5 for the control group and the average increase in number of cavities was 5.6, 6.2, and 6.4, respectively. The average increase in caries score was 18.7, 19.8, and 19.4 points, respectively, for the three groups. By every method of comparison there was a consistent tendency for the progress of caries in the groups receiving the milk supplements to be slightly less than in the control group, but the differences were too small to be of either statistical or practical significance.

Nutrition in pregnancy, A. F. MORGAN (*Pub. Health Nursing, 30 (1938), No. 10, pp. 576–583*).—This discussion of the special requirements during pregnancy for calories, protein, minerals (particularly calcium, phosphorus, and iron), and vitamins is accompanied by practical suggestions concerning the newer dietary practices in this period. "Many of the supposedly inevitable discomforts and dangers of pregnancy have been found to follow from mistakes in diet and are therefore avoidable."

A study of English diets by the individual method.—III, Pregnant women at different economic levels, R. A. MCCANCE, E. M. WIDDOWSON, and C. M. VERDON-ROE (*Jour. Hyg.* [*London*], *38 (1938), No. 5, pp. 596–622*).—Continuing the series of investigations (E. S. R., 76, p. 719), the authors conducted a dietary study by the individual method on 120 women in the third to ninth months of pregnancy. In addition to the record of the food intake for 1 week, information was obtained on height and weight of the subjects, total income, rental cost, and size of family. Hemoglobin determinations were made, using the Haldane standard of 100 percent=13.8 g of hemoglobin per 100 cc of blood.

When the subjects were divided into six groups on the basis of the amount of weekly income, less the rental cost, available for each member of the family, in general the intakes of protein, calcium, phosphorus, iron, and vitamin B_1 rose, while the intakes of calories, fat, and carbohydrate did not progress with the increase in incomes, which ranged from less than 6s. to more than 40s. per week. The following are the average daily intakes of the six groups: Protein 60–86 g, of which 28–55 g represented animal protein; calcium 0.51–0.94 g; phosphorus 0.8–1.45 g; total iron 0.0086–0.0148 g, of which 0.0064–0.0108 g represented inorganic iron; vitamin B_1 approximately 209–454 International Units; calories 2,155–2,781; fat 86–121 g; and carbohydrate 267–317 g per day. The consumption of foods such as fresh milk, fruits, vegetables, meat, and fish increased with rising income, while that of white bread, cereals, and condensed and dried milks decreased. The amounts of potatoes consumed increased in the four lower income groups and decreased in the two upper groups. The average hemoglobin values increased from 76 percent up to 90 percent in the five groups tested, and in general the women on the higher income levels were less anemic than those on the lower levels.

The effect of the sulphydryl compounds on milk production, R. G. Daggs and V. S. M. Lidfeldt. (Univ. Vt. et al.). (*Jour. Nutr., 15 (1938), No. 3, pp. 211–220, figs. 2*).—Further proof that sulfhydryl compounds are involved in the stimulating effect of various dietary constituents on milk production in the rat is presented in lactation indexes, as defined in an earlier paper of the series (E. S. R., 75, p. 421), of diets in which the only variables were various sulfur- and nonsulfur-containing proteins or protein derivatives.

The sulfhydryl amino acids existing either as such (cysteine) or in the potential form (cystine, methionine) and mixtures of glycine and glutamic acid with cystine and cysteine, respectively, had lactogenic properties. The nonsulfur amino acids of the tripeptide glutathione, glycine, and glutamic acid had no lactogenic action. At the taurine stage of the intermediary metabolism of the sulfhydryl compounds, the lactogenic effect was not entirely destroyed but the taurocholic acid was ineffective. When the cystine content of the diet was increased from 1 to 2 parts, the lactation index was lowered slightly and to 5 parts decidedly. One part of cystine in the diet is considered optimal. No explanation is advanced for the lactogenic effect of the S–H group except that it is thought not to take place in the liver, since the prevention by choline of fatty liver induced by cystine diets did not limit the lactation stimulating effect of the cystine.

Vitamins and hormones, J. R. Murlin (*Jour. Amer. Dietet. Assoc., 14 (1938), No. 6, pp. 397–411*).—The interrelationships that have been demonstrated between the vitamins A, B_1, C, D, and E and the endocrinal secretions are discussed in this review paper, which contains 50 references to the literature.

A study of the biophotometer as a means of measuring the vitamin A status of human adults, L. E. Booher and D. E. Williams. (U. S. D. A.). (*Jour. Nutr., 16 (1938), No. 4, pp. 343–354*).—Light threshold measurements were made in duplicate for 106 adults at 5-min. intervals during a 10-min. preliminary period of dark adaptation, immediately after a 3-min. period of adaptation to the bright light of a large diffusing screen, and at 3-min. intervals during a 9-min.

recovery period. The brightness of the central dot of the biophotometer quincunx corresponding to the different rheostat dial settings was calibrated in terms of microlamberts.

The critical threshold value, which is the value measured during the 20-sec. interval immediately following the light adaptation period, was greater than 3 microlamberts for 15 of the subjects, between 1 and 3 for 68, and less than 1 for the remaining 23 subjects. When 13 of the subjects were given from 5,000 to 8,500 International Units of vitamin A daily in the form of halibut-liver oil for 4 weeks, the critical threshold value and that of the last measurement taken during the 9-min. recovery period decreased in 5 and did not change in the other 8 subjects. The borderline regions for the critical light threshold and for the threshold at the end of the recovery period, separating the normal from the vitamin A-deficient subjects, were around 3 and 0.2 microlamberts, respectively. The factor of learning and the time of day had no significant bearing on the measurements made on 5 normal subjects.

The authors conclude that "provided the worker is equipped with suitable means for frequent calibration of the intensity of the light emanating from the illuminated central dot of the test screen and from the large diffusing plate used for light adaptation, the biophotometer may be adequate for detecting marked dysadaptation in adults."

Vitamin A deficiency and dark adaptation, B. L. Isaacs, F. T. Jung, and A. C. Ivy (*Jour. Amer. Med. Assoc., 111 (1938), No. 9, pp. 777–780*).—Daily biophotometer readings were made at the same hour for 10 consecutive days on 20 apparently healthy adults immediately after they entered the dark room, and 5 and 10 min. later; 30 sec., 3, 6, and 10 min. after a 3-min. exposure to light; and 30 sec. and 3 min. after a second exposure to light. Two sets of readings were also made, 1 week apart, on another group of 123 adults. Food intake records and information on clinical symptoms of vitamin A deficiency were provided by each subject.

Three fallacies were demonstrated in the test, the first being that the readings commonly used, which are those obtained just after the subject enters the dark room and 30 sec. and 10 min. after the first exposure to light, are the most unreliable, while those obtained 5 and 10 min. after the subject enters and 3 and 6 min. after the first exposure to light are the most reliable. The second fallacy is the introduction of errors when the dial readings are translated into millifootcandles, and the third is in the selection of subnormal subjects from a large group on the basis of the reading taken 30 sec. after the first exposure to light.

No correlation could be demonstrated between the vitamin A intake, which ranged from about 1,650 to 9,725 International Units, and the biophotometer readings or between the intake and the presence of clinical symptoms of vitamin A deficiency. The authors believe that the criteria generally chosen for the recognition of vitamin A deficiency by means of the biophotometer are not the most reliable criteria, and that more study is essential before the biophotometer can be used directly for the detection of vitamin A deficiency in the human being.

The biophotometer as a test for vitamin A deficiency, C. E. Snelling (*Jour. Ped., 13 (1938), No. 4, pp. 506–509*).—Biophotometer tests were made twice within a period of 3 weeks on 34 children receiving no additional vitamin A, and again after 3 weeks and 6 weeks when 13,000 International Units of 50 percent oleum percomorphum were given daily.

Three children were normal, 14 borderline, and 17 abnormal in the initial test. In the second test 9 showed improvement, 7 decreased in dark adaptation, and 18 remained unchanged as compared to 11, 5, and 18 in the third test and 3, 6, and 15, respectively, in the final test, which was made on 24 children. From the inconsistent results the authors conclude that the biophotometer test is not satisfactory as a method of estimating in children the variation in dark adaptation, such as might be produced by vitamin A deficiency.

Inadequacy of conjunctival smears in the diagnosis of slight vitamin A deficiency in adults, J. B. YOUMANS, M. B. and M. G. CORLETTE, and H. FRANK (*Jour. Lab. and Clin. Med., 23 (1938), No. 7, pp. 663-670, fig. 1*).—The authors studied the character of the cells obtained from scrapings of the bulbar conjunctiva of each eye of 25 presumably healthy adults receiving an adequate diet before and after the administration of 25,000 International Units of vitamin A in the form of halibut-liver oil daily for 30 days. Similar tests were made on 45 hospitalized patients. For the purposes of the study the cells were classified as nucleated and nonnucleated, the former being considered normal and the latter cornified cells.

Before vitamin A therapy the normal subjects averaged 58.8 percent of cornified cells in the smears from the two eyes, with a range of from 4 to 97 percent, and 60.4 percent in the separate eyes, with a range of from 3 to 100 percent. About two thirds of the group showed a difference between the right and left eyes of 10 percent or more on one or more smears. After the administration of vitamin A there was a decrease in the number of cornified cells in the combined smears of 20 subjects, with the average for the whole group being 39.2 percent. When the eyes were considered separately, it was found that only 8 of the subjects had fewer cornified cells in both eyes. Also, the differences in the percentage of cornified cells before and after added vitamin A were no greater than the differences in successive smears or between the two eyes before the vitamin A was given. Similar variations were noted in the group of patients. Of 9 patients who received the vitamin A supplement, 4 showed as many or more cornified cells in the combined smears after vitamin A as before, and only 2 had other evidence of vitamin A deficiency. It is concluded that the absence of cornified cells is not evidence of a mild vitamin A deficiency in the adult. It is noted that 7 of the normal subjects presented evidence of mild vitamin A deficiency by the photometer test and yet had no more cornified cells than others who had normal photometer readings.

The story of vitamin B_1, compiled by C. R. ADDINALL (*Rahway, N. J.: Merck & Co., [1937], pp. 56, figs. 9*).—In this brochure on vitamine B_1 the current literature on the isolation and synthesis of the vitamin, its properties and standards, the methods of assay and the unitage, the physiology, effects of a deficiency, and the distribution of vitamin B_1 in foodstuffs is reviewed.

New international standard for vitamin B_1 (*Lancet [London], 1938, II, No. 22, p. 1258; also in Brit. Med. Jour., No. 4064 (1938), p. 1093*).—Attention is called to the announcement that a preparation of crystalline vitamin B_1 hydrochloride has been adopted by the permanent commission on biological standardization of the Health Organization of the League of Nations as the second international standard for vitamin B_1. The International Unit is defined as the antineuritic activity of 3 μg of the new standard preparation. The standard is distributed by the department of biological standards of the National Institute for Medical Research, Great Britain.

Vitamin B_1 (thiamin) and its use in medicine, R. R. WILLIAMS and T. D. SPIES (*New York: Macmillan Co., 1938, pp. XVI+411, [pl. 1], figs. 19*).—Part 1 of this extensive review of the literature on vitamin B_1 deals with the facts which the authors consider of immediate value in the practice of medicine, and part 2 with the history of the vitamin and the experimental evidence derived from laboratory work.

Human requirements for vitamin B_1, G. R. COWGILL (*Jour. Amer. Med. Assoc., 111* (*1938*), *No. 11, pp. 1009–1016*).—Among the factors influencing the vitamin B_1 requirements which are discussed are carbohydrate metabolism, the water-soluble nature of the vitamin and its ready elimination through the kidneys, and the failure of absorption when diarrhea is present. The limitations of the author's formula for determining the vitamin B_1 requirement are discussed, and a table is presented for use with the formula to obtain the vitamin values in terms of International Units and of different quantities of thiamin chloride. The requirement of the average 70-kg person is tentatively set at approximately 280 I. U., assuming an average degree of activity and, therefore, level of daily energy intake. The requirement for the nursing mother, computed on the basis of caloric intake, is from 15 to 20 units and for the child from 20 to 25 units per 100 calories. For the very young infant the minimum requirement is given as approximately 80 units. The bibliography lists about 40 references.

The clinical significance and estimation of blood vitamin B_1, E. N. ROWLANDS and J. F. WILKINSON (*Brit. Med. Jour., No. 4060* (*1938*), *pp. 878–883, figs. 3*).—By a modification of the Schopfer method for estimating vitamin B_1 in blood similar to the method described by Meiklejohn (E. S. R., 79, p. 11), the authors determined the standard range for normal blood to be between 6.5 and 16.5 μg of vitamin B_1 per 100 cc of whole blood. Estimations made on 48 patients with a variety of diseases placed the vitamin B_1 content of the blood below the 6.5 μg level in cases of malnutrition, diabetic, nutritional, and alcoholic neuritis, scurvy, simple achlorhydric anemia, pernicious anemia with neurological involvement, thyrotoxicosis, and diabetes mellitus. Values within the normal range are reported for patients with polyneuritis, pernicious anemia without spinal cord involvement, secondary microcytic anemia, and subacute combined degeneration of the spinal cord.

Production of microcytic hypochromic anemia in puppies on synthetic diet deficient in rat antidermatitis factor (vitamin B_6), P. J. FOUTS, O. M. HELMER, S. LEPKOVSKY, and T. H. JUKES. (Univ. Calif. et al.). (*Jour. Nutr., 16* (*1938*), *No. 2, pp. 197–207*).—Nineteen puppies were maintained on a synthetic diet consisting of 41.4 g purified casein, 29.6 sucrose, 25.7 Crisco, 2 bone ash, and 1.3 g salt mixture No. 185, with 15 drops of halibut-liver oil daily and supplemented by various combinations of the following: Riboflavin, concentrated vitamin B, thiamin, purified liver extract 1A, and rice polish extracts K-48 and K-87.D. Normal growth, red blood cell counts, and hemoglobin values were maintained in the dogs receiving the basal diet with all the supplements. The removal from the diet of the liver extract (containing the chick antidermatitis factor and nicotinic acid), and the rice polish extract (containing the rat antidermatitis factor) produced blacktongue. Two dogs receiving all supplements except the liver extract died with symptoms of blacktongue. Severe anemia developed only in the four dogs receiving all supplements except the rice polish extract. The addition of the rice polish extract to the diet of three of the dogs was followed by a rise in reticulocytes and rapid disappearance of anemia. The administration of iron to the fourth dog failed to cure the anemia.

Vitamin C: Methods of assay and dietary sources, O. A. BESSEY (*Jour. Amer. Med. Assoc., 111* (*1938*), *No. 14, pp. 1290–1298*).—The preventive and curative method of bio-assay for vitamin C are compared, and the present state of the chemical methods, particularly the indophenol titration method and its modifications, and the urine technic are discussed in this review paper. Varietal and seasonal differences and the effects of maturity, storage, freezing, and processing on the Vitamin C content of fruits and vegetables are discussed. A table is presented containing values expressed in milligrams of ascorbic acid per 100 g and in International Units of vitamin C for some 100 foods. The bibliography lists about 110 references.

The physiology of vitamin C, C. G. King (*Jour. Amer. Med. Assoc., 111 (1938), No. 12, pp. 1098–1101*).—The author reviews the distribution of vitamin C in plants and animals, its functional role in animal tissues, and its relation to specific enzymes as indicated from the reports given by various investigators but not established as yet. The bibliography lists about 50 references.

A critical review of recent literature on the dust atopen and on vitamin C in relation to hypersensitiveness, M. Walzer (*Jour. Allergy, 10 (1938), No. 1, pp. 72–94*).—As regards vitamin C, the work reviewed deals with the possible effect of vitamin C upon the phenomena of anaphylaxis and arsenic poisoning and tuberculin hypersensitivity in guinea pigs, and various types of human hypersensitivity. The conclusion is drawn that "for the present, except in cases where there is a definite vitamin deficiency, the use of cevitamic acid in the various allergic illnesses may be considered as empiric. A definite role for vitamin C in the immunologic mechanism of hypersensitiveness has not yet been established." An extensive list of references is appended.

Dietary deficiencies as a factor in the etiology of diffuse alveolar atrophy, P. E. Doyle (*Jour. Amer. Dental Assoc. and Dental Cosmos, 25 (1938), No. 9, pp. 1436–1446, figs. 11*).—Evidence from the literature, including investigations of the author and associates (E. S. R., 78, p. 573), is presented in support of the statement that "vitamin C deficiency is the only nutritional deficiency which, in our experience, produces the characteristic features of the systemic type of pyorrhea in experimental animals. Vitamin C is essential to maintenance of health of the oral tissues."

The relation of vitamin C therapy to other forms of therapy for pyorrhea is discussed by analogy to diabetes. In a diabetic, surgical procedure should be postponed until the defective carbohydrate metabolism has been corrected by the use of insulin. In pyorrhea, blood determinations for ascorbic acid should first be made, and if a deficiency is found to exist it should be remedied by the administration of ascorbic acid as a prerequisite but not as a substitute for other treatment.

Vitamin C content of vegetables.—IX, Influence of method of cooking on vitamin C content of cabbage, M. Wellington and D. K. Tressler. (N. Y. State Expt. Sta.). (*Food Res.. 3 (1938), No. 3, pp. 311–316*).—In continuation of the series of studies noted previously (E. S. R., 80. p. 427), the authors determined the ascorbic acid content of freshly harvested mature cabbage of the Glory variety in the raw state and after boiling, steaming, and panning and of the cooking water. The boiling process consisted of dropping 360-g samples of finely shredded, ½-in. strips and quarters of cabbage into 1,800 cc of briskly boiling water, and after a 2-min. allowance for the water to return to boiling the shredded cabbage was cooked for 8 min., the strips for 10, and the quarters for 16 min. In the steaming process the samples of finely shredded and quartered cabbage were steamed for 14 and 25 min., respectively, in enameled steamers. In panning, the finely shredded cabbage was mixed with 1 teaspoonful of Crisco and heated very slowly for 10 min. and at a higher temperature for an additional 10 min.

The following values are reported for determinations made on the wet basis: Finely shredded, boiled cabbage approximately 0.09 mg, strips and quarters of boiled cabbage 0.13 mg, finely shredded steamed cabbage 0.23 mg, quarters of steamed cabbage 0.26 mg, and finely shredded panned cabbage 0.2

mg of ascorbic acid per gram. The cooking water drained for 1 min. from the shreds of boiled cabbage contained about 0.05 mg, strips 0.036, and quarters 0.045 mg, and from the steamed shredded cabbage 0.223 and the quarters of steamed cabbage 0.185 mg of ascorbic acid per gram. The original ascorbic acid content was about 31 percent destroyed in the panned cabbage, 26 percent in the shredded steamed, 16 percent in the quartered boiled, 15 percent in the strips, 12 percent in the shreds of boiled cabbage and about 10 percent in the quartered steamed cabbage.

Ascorbic acid content of commercially canned tomatoes and tomato juice, O. E. McElroy and H. E. Munsell. (U. S. D. A.). *(Jour. Amer. Med. Assoc., 111 (1938), No. 23, pp. 2138, 2139).*—To supplement a previous report by Bailey and Fisher (E. S. R., 79, p. 568), the authors present data on the ascorbic acid content of 11 brands of canned tomato juice and of 6 of canned tomatoes purchased between April and November 1937. Using the Musulin and King modification (E. S. R., 77, p. 743) of the indophenol titration method, determinations were made on triplicate samples from 12 cans of each brand of juice and 10 cans of each brand of tomatoes.

With the exception of one brand which averaged 0.23 mg, the average ascorbic acid values for the tomato juice were between 0.14 and 0.18 mg per cubic centimeter of juice. The average values for the canned tomatoes were between 0.17 and 0.19 mg per cubic centimeter. The variation in ascorbic acid content of different cans of the same brand was as great as that between different brands.

Ascorbigen in plant and animal tissues, B. C. Guha and P. N. Sen-Gupta *(Nature [London], 141 (1938), No. 3578, p. 974).*—Previous evidence from the senior author's laboratory (E. S. R., 78, p. 892) and elsewhere (E. S. R., 79, p. 714) of the presence in plant and animal tissues of ascorbic acid in a combined form (which the authors term ascorbigen) and of a nonspecific reducing substance also in combined form is reviewed briefly, with the conclusion that estimations of ascorbic acid in foodstuffs should include free ascorbic acid, dehydroascorbic acid, and ascorbigen. It is stated that for this purpose a method has been developed which involves treatment of the material with hydrogen sulfide in the hot condition, removal of the hydrogen sulfide in a current of carbon dioxide, and treatment of an aliquot with ascorbic acid oxidase.

Critical remarks on the determination of urinary excretion of ascorbic acid, M. van Eekelen and M. Heinemann *(Jour. Clin. Invest., 17 (1938), No. 3, pp. 293–299, figs. 6).*—Experiments are presented demonstrating the magnitude and variability of the errors which may occur in the determination of ascorbic acid in urine by indophenol titration if various interfering substances are not removed. The method followed by the authors is given in considerable detail.

In saturation tests the point at which the urinary excretion of ascorbic acid increases after test doses is considered as the saturation point and occurs when the blood concentration is 14 mg per liter. If the dose is given orally the surplus output in the saturated subject amounts to at least 50 percent of the 24-hr. excretion in 6 hr. After subcutaneous injection the surplus is entirely excreted within 6 hr. The rise occurs in the second 3 hr. in the first case and in the first 3 hr. in the second. Very large doses may induce an increased excretion even in unsaturated subjects. Most investigators never use a dose greater than 300 mg. When given intravenously, the concentration in the blood is elevated so suddenly that a transitory overflow in the urine results before saturation. "Saturation tests, therefore, should be carried out by giving ascorbic acid per os or for special purposes subcutaneously and in modest daily doses. Intravenous administration of even modest doses or intake by mouth of an excessively large dose at one time can simulate saturation by causing a urinary surplus excretion before the depletion of the body has been overcome."

In the method now followed by the authors the test dose of ascorbic acid is given immediately after voiding at 9 a. m. and its concentration in the urine is determined in samples voided at 12 m. and 3 p. m. It is considered difficult, if not impossible, to distinguish a normal level of urinary excretion without the use of test doses. "Biological assay indicates that the substance causing increased reducing power of the urine after massive doses of ascorbic acid is indeed ascorbic acid. Whether or not the small normal excretion actually represents ascorbic acid has not been established yet and seems of little importance for the purposes of our study."

Physiology and pathology of vitamin D, A. T. Shohl (*Jour. Amer. Med. Assoc., 111 (1938), No. 7, pp. 614–619*).—The discussion in this review paper deals with the production of rachitic bone and the healing process, the chemistry of calcium and phosphorus precipitation, the presence of phosphatase in the serum, the effects of administering huge excesses of vitamin D, and the relation of rickets to growth and to the diet. The bibliography lists about 65 references.

The human requirement of vitamin D, P. C. Jeans and G. Stearns (*Jour. Amer. Med. Assoc., 111 (1938), No. 8, pp. 703–711*).—The requirements of the different age groups are discussed separately in this review of the literature. In terms of a concentrate of vitamin D contained in average high grade cod-liver oil, the daily requirement of the full-term artificially fed and breast-fed infants is tentatively set at from 300 to 400 International Units. For premature infants the requirement is doubled during the early period of most rapid growth, after which time it is the same as for full-term infants, and of children between infancy and adolescence it is from 300 to 400 units, together with 750 cc of milk. For adolescents and adults the optimal amount of vitamin D has not been determined, but from 300 to 400 units is suggested for the former group and at least 800 units for the pregnant woman. The bibliography lists about 80 references.

The paralysis in the young of vitamin E deficient female rats, H. S. Olcott (*Jour. Nutr., 15 (1938), No. 3, pp. 221–227, pl. 1*).—Paralysis of the young of vitamin E-deficient female rats is shown to be due to lesions of the skeletal muscles very similar to those reported by various observers as occurring in guinea pigs and rabbits on purified diets. It is noted that Goettsch and Pappenheimer (E. S. R., 66, p. 796) reported that vitamin E concentrates alone did not prevent or cure the so-called nutritional muscular dystrophy in guinea pigs, although all of the foodstuffs which were effective in their studies contained vitamin E, and that Morgulis and Spencer (E. S. R., 76, p. 882) showed that at least two independent factors are required, one of which may be vitamin E. It is pointed out that this hypothesis, if correct, would furnish a possible explanation for the increase in the incidence and severity of the disease, as shown by Madsen et al. (E. S. R., 74, p. 82) to occur when cod-liver oil is included in diets fed to Herbivora.

The vitamin G content of Colorado Pascal celery, C. F. Poe, O. Gant, and P. P. Cooper (*Colo. Univ. Studies, 25 (1938), No. 3, pp. 169–172, figs. 2*).—The vitamin G content of 16 samples of the celery of the 1933 and 1934 crops was determined by the Bourquin-Sherman method (E. S. R., 66, p. 410) on groups of rats maintained on a diet consisting of casein 18 percent, butterfat 8, cod-liver oil 2, Wesson salt mixture 4, and cornstarch 68 percent, supplemented by an alcoholic extract of whole wheat to supply vitamin B_1. The celery stalks and the light and green leaves were fed at different levels, with one male and one female rat on each level. The 16 samples of stalks had an average content of 4.9 Sherman units per ounce, the 8 of light leaves 30.02, and the 2 samples of green leaves 31.33 Sherman units of vitamin G per ounce.

Treatment of the hemorrhagic tendency in jaundice, with special reference to vitamin K, A. M. SNELL, H. R. BUTT, and A. E. OSTERBERG (*Amer. Jour. Digest. Diseases, 5 (1938), No. 9, pp 590–596, figs. 6*).—Daily doses of from 200 to 1,000 mg of a concentrate of vitamin K prepared from purified fish meal, together with from 1,000 to 4,000 mg of bile salts or human bile were administered orally to about 30 patients with obstructive jaundice, and the response of the prothrombin time and the concentration of prothrombin in the blood plasma were noted. The results indicate that the administration of the vitamin K and bile salts together increased the concentration of prothrombin and thereby reduced the clotting time of the blood. The vitamin administered alone proved ineffective, while the bile or bile salts alone showed some effect. The authors recommend the administration of vitamin K and bile salts in the preoperative preparation of jaundiced patients and in cases of post-operative bleeding.

The treatment of subclinical and classic pellagra: Use of nicotinic acid, nicotinic acid amide, and sodium nicotinate, with special reference to the vasodilator action and the effect on mental symptoms, T. D. SPIES, W. B. BEAN, and R. E. STONE (*Jour. Amer. Med. Assoc., 111 (1938), No. 7, pp. 584–592, figs. 2*).—In continuation of a series of studies (E. S. R., 79, p. 571) and in addition to the findings noted from another source, the authors report the results of further therapeutic tests with nicotinic acid and its compounds on additional subjects.

The oral administration of from 50 mg to 1 g of nicotinic acid, sodium nicotinate, nicotinic acid amide, or coramine to 73 hospitalized adult pellagrins resulted in remission of the pellagrous symptoms, including the mental abnormalities, and a decrease or cessation of porphyrinuria within 72 hr. after the first dose was administered. A similar response to the 100 mg dose was given by 36 children with acute pellagra. Trigonelline proved ineffective in amounts of from 1 to 1.5 g. Two of the adults with cardiac decompensation required from 40 to 100 mg of thiamin chloride injected daily, as well as 500 mg of nicotinic acid administered orally for 3 and 4 days, respectively, before they exhibited a decrease in dyspnea, orthopnea, and edema.

The oral administration of 40 mg or more or the intravenous injection of 10 or 20 mg of nicotinic acid to 190 adults with subclinical pellagra prevented recurrence of the disease. The best response was obtained in the patients free from coexisting disease who were receiving adequate amounts of a well-balanced diet and sufficient rest.

The oral administration of 100 mg or the injection of from 5 to 25 mg of nicotinic acid to 100 normal adults produced dilation of the small blood vessels of the skin of the face and upper part of the trunk characterized by flushing, burning, itching, and a sensation of local heat in the skin in about half of the group and in practically all cases when the dosage was increased to 200 mg. The pulse, blood pressure, and respiration were not affected. The reactions differed from those noted after the intra-arterial injection of acetylcholine.

The oral administration of from 200 to 1,000 mg of nicotinic acid to 7 patients with radiation sickness produced prompt cessation of the nausea, vomiting, anorexia, and headache. Preliminary tests with 6 patients receiving a 30-g dose of aminoacetic acid 1 hr. before a 500-mg oral dose of nicotinic acid delayed the elevation of the temperature that follows the administration of nicotinic acid alone.

Nicotinic acid in the treatment of pellagra: Report in a case of marked dementia, C. N. Bogart (*Jour. Amer. Med. Assoc., 111 (1938), No. 7, pp. 613, 614*).—The author reports that the oral administration of nicotinic acid in doses of 100 mg five times a day to a female adult with severe pellagrous dermatitis resulted in definite improvement in the physical appearance and in the mental condition within 48 hr. after the first dose was given and in complete recovery after the fourth day. The patient was continued on a full pellagra-preventive diet containing from 120 to 180 g of dried yeast daily. Over a period of 2 mo. a total of 14 g of nicotinic acid had been administered, and on only two occasions had the patient shown even a slight reaction to the dose.

The quantitative collection of urine from small children, E. E. Hawley (*Jour. Ped., 12 (1938), No. 3, pp. 381–385, figs. 7*).—Descriptions, with diagrams and photographs, are given of restraining jackets and necessary apparatus for collecting 24-hr. samples of urine, particularly for ascorbic acid analyses, from very young boy babies and for girl babies large enough to be fastened in a nursery chair.

A simple respirometer for small animals, E. G. Boettiger (*Nature [London], 142 (1938), No. 3586, pp. 151, 152, fig. 1*).—A constant pressure type of respirometer capable of measuring oxygen consumption during the early life of the mouse is described and illustrated.

TEXTILES AND CLOTHING

Textiles and clothing [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1938, pp. 10–15*).—Included in this annual report (E. S. R., 78, p. 734) are summaries of studies on quality guides for purchasers of terry towels, sheeting, and broadcloth; a cooperative study with the Bureau of Plant Industry on the use value of various qualities of American-grown wools and the role of micro-organisms in the deterioration of wool blankets; a cooperative study with the Works Progress Administration and various State colleges, universities, and public schools of the body measurements of children from 4 to 14 yr. of age; and a study of the suitability of various starches for cotton fabric finishing.

Blankets, sheets, and towels for the home, K. P. Hess (*Kansas Sta. Bul. 281 (1938), pp. 31, figs. 13*).—The information contained in this bulletin is based chiefly on the results of textile studies made at the station and deals with the qualities desirable in blankets, sheets, and bath towels and the points to look for in the selection of these articles.

The hose we buy and wear, R. C. Cook et al. (*[Cincinnati]: Ohio Home Econ. Assoc., Standardization Com., 1937, rev. ed., pp. 44, figs. 18*).—Part 1 of this report deals with the methods of constructing women's hose and the wearing quality, part 2 with the methods of selling, and part 3 with the standards of construction and inspection set up by the Standardization Committee of the National Association of Hosiery Manufacturers.

HOME MANAGEMENT AND EQUIPMENT

Allocation of time by employed married women in Rhode Island, B. M. Kuschke (*Rhode Island Sta. Bul. 267 (1938), pp. 20*).—In a study of the methods by which married women employed outside the home carry on their homemaking activities, the time records for 1 week of 60 rural and urban women were analyzed. The women had been employed on an average of 10 yr. at an average weekly wage of $22.90. About 13 percent of the husbands were unemployed and 22 percent had only part time employment. The total family income averaged $39.88 a week. There were no children in 68 percent of the families. Although 58 percent of the women were working from necessity, 62 percent enjoyed their work and the others were willing to give it up if it was financially possible.

When the average weekly distribution of time spent in home duties by the employed women was compared with that of 102 unemployed married women as noted in a previous study (E. S. R., 62, p. 598), it was found that the latter group gave more time to care of the house and the children, home management, laundry and sewing, sleep, and leisure time activities. The employed women averaged 58 hr. 15 min. a week in sleep, 39 hr. 15 min. in outside work, 11 hr. 40 min. in food preparation, 8 hr. 45 min. in eating meals, 5 hr. 35 min. in care of the house, 7 hr. 15 min. in personal care, 2 hr. in sewing, 2 hr. 30 min. in laundry work, 50 min. in care of children, 2 hr. 20 min. in home management, 4 hr. 10 min. going to and from work, and 24 hr. 50 min. in leisure time activities.

While paid help was available in less than one-third of the homes, nearly three-fourths of the women had family help. Practically all the homes were equipped with an electric iron and a refrigerator, two-thirds had a vacuum cleaner and a gas stove, one-third an electric stove, and one-fourth had an electric washer. Bread was purchased in 94 percent of the homes, but 75 percent did some baking, 35 percent did home canning, 33 percent made all their own clothing, and 57 percent did part or all of the laundry work. About 36 percent of the women had altered their homemaking plans mainly by using the commercial laundry, buying prepared foods, and having an electric range and mechanical refrigerator, in order to carry on outside work. The study indicates that it is possible for a woman to assume successfully the double responsibility to home and outside work when necessary.

Economic studies [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1938, pp. 2–8*).—This report of the Division of Family Economics summarizes the data of the Works Progress Administration study (E. S. R., 78, p. 735) dealing with comparative incomes and consumption patterns as related to increases in family net worth and spending for family living of village, small city, and farm families in various geographic regions of the United States.

Housing and household equipment [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1938, p. 15*).—This annual report (E. S. R., 78, p. 735) contains data of a cooperative study with the Bureau of Agricultural Engineering on the efficiency of different fuels used for cooking.

MISCELLANEOUS

Research—a national resource.—I, Relation of the Federal Government to research: National Resources Committee, December 1938 (*Washington: Govt., 1938, pp. VII+255, figs. 2*).—This report is discussed editorially on page 577.

Federal relations to research: National Resources Committee, January 1939 (*Washington: Govt., 1939, pp. 30*).—This is a digest of the report noted above.

NOTES

Connecticut College and Storrs Station.—Dr. Irving G. Davis, professor of agricultural economics and agricultural economist since 1920, and recently elected president of the American Farm Economic Association, died March 15, aged 54 years. A graduate of Bates College in 1906, he had studied at the Massachusetts College, the University of Wisconsin, and Harvard University, receiving the Ph. D. degree from the last-named institution in 1937. He had also been engaged in extension work in Connecticut and since 1936 had been chairman of the advisory committee on agriculture of the American Economic Association.

The Poultry Science Association has awarded its research prize of $100 to Drs. Erwin L. Jungherr, professor and associate in animal pathology, and Walter Landauer, geneticist, for their joint publication on Studies on Fowl Paralysis—III, A Condition Resembling Osteopetrosis (Marble Bone) in the Common Fowl, published as Bulletin 222 (E. S. R., 79, p. 397).

Dr. Nathan L. Whetten, associate professor of rural sociology, is on sabbatical leave, traveling in the United States and Mexico in connection with a study of the development of rural education and colonization.

Hawaii Station.—Dr. Edmund C. Shorey, chemist from 1903 to 1907 and subsequently associated with the soil fertility studies of the U. S. Department of Agriculture until 1918 and again from 1922 until his retirement as senior biochemist in 1935, died in Washington, D. C., on January 30 at the age of 74 years. His major interest was in the organic constituents of soils and the nature of humus, to the knowledge of which he made many important contributions.

Idaho University and Station.—An experimental plant for the production of fuel alcohol from cull potatoes is being operated at Idaho Falls. The capacity of the plant is 150 sacks of potatoes and 150 gal. of alcohol per day.

Dr. W. E. Shull has been appointed head of the department of entomology vice Dr. Claude Wakeland, resigned. Dr. Robert A. Fisher of the U. S. D. A. Bureau of Entomology and Plant Quarantine has been appointed assistant professor of entomology, and Leonard E. Ensminger, assistant agricultural chemist, the latter vice Dr. Theron B. Hutchings, resigned.

Illinois University and Station.—Henry P. Rusk, head of the department of animal husbandry since 1923 and a member of the staff for 29 years, has been appointed dean of the College of Agriculture, director of the agricultural experiment station, and director of the extension service in agriculture and home economics to succeed Dean and Director J. C. Blair upon his retirement on September 1.

Kansas College and Station.—A plant research laboratory (E. S. R., 79, p. 431) has been completed at a cost of $26,500. This laboratory consists of a two-story building, 20 by 126 ft., constructed of native stone and connected with four greenhouses, each 29 by 100 ft.

Dr. J. H. Parker, professor of agronomy, has resigned to become director of the Kansas Wheat Improvement Association, with headquarters in Manhattan, and has been succeeded by L. P. Reitz of the U. S. Department of Agriculture. Elizabeth P. Harling, seed analyst in the department of agronomy and State Seed Laboratory since 1912, died November 30, 1938, and has been succeeded by Dr. Elva Norris.

Louisiana University.—A school of Pan-American Agriculture to operate as a unit of the College of Agriculture and with its ultimate goal a study of the farm problems of South and Central America is in process of organization with the expectation of opening next fall. Dr. T. Lynn Smith, head of the university department of sociology, has been granted leave of absence for the 1939 university summer session to conduct a sociological and economic survey of Central and South American countries.

New York State Station.—Dr. G D. Oberle has been appointed associate in research (pomology), effective March 1. This appointment fills the vacancy occasioned by the death of G. P. Van Eseltine (E. S. R., 80, p. 142). Dr. Oberle will continue the work on the breeding of squash resistant to mosaic, as well as the breeding of fruits and other vegetables for resistance to diseases and insects.

Cornell University and Station.—Three graduate fellowships with an annual stipend of $1,000 each are to be awarded in the plant sciences, animal and social sciences, and agricultural engineering under a gift from the Henry Strong Dennison Medical Foundation, Inc. The fellowships will be granted to encourage young graduate students "who are especially gifted and qualified to carry on research work in the science of agriculture."

Dr. George C. Embody, professor of aquiculture since 1920 and an outstanding authority on the subject, died at Daytona Beach, Fla., on February 17 at the age of 62 years. Dr. Embody began his services in this field in 1911 and had worked especially on the nutrition and genetics of fishes, pond and stream ecology, and hatchery methods.

Frank L. Fairbanks, professor of agricultural engineering since 1935 and associated with the agricultural engineering work of the institution since 1917, died on March 5 following an automobile accident. He was 54 years of age and a graduate of the institution in 1910. His work had dealt especially with farm power machinery, the heating, ventilation, and air conditioning of animal shelters, and rural electrification.

North Dakota College and Station.—State appropriations have again been made for the substations located at Edgeley, Langdon, and Williston, permitting the resumption of operations. The Hettinger Substation is also to be reopened in cooperation with the Hettinger School District and used for Smith-Hughes teaching and demonstration work.

The station has two new wheat varieties which will be distributed to farmers for increase and testing in every county of the State. Further milling and baking tests will be run at the end of the season. A new type of macaroni cooker has been received by the department of animal and human nutrition for use in the durum wheat improvement program. The cooker was made according to revised plans drawn by the Dominion Laboratory of the Trade and Commerce Department of Winnipeg, Canada, and is believed to be the first of its kind in the United States.

Modernization of the original poultry house has been accomplished with the assistance of the Works Progress Administration, thereby increasing the facilities available to poultry research.

Dr. John H. Shepperd, president emeritus since 1937 and associated with the institution since 1893, died January 22 in Fargo at the age of 70 years. A native of Iowa, he was graduated from the Iowa College in 1891 and received its honorary degree of doctor of agriculture in 1929. He is also said to have been the first student to receive an advanced degree in agriculture from the University of Wisconsin, which bestowed upon him the M. S. A. degree in 1893. His long service in North Dakota included the following positions: Professor of agriculture and agriculturist, 1893–1904; dean of agriculture, 1905–15; vice director of the station and agriculturist, 1905–18; chairman of the department of animal husbandry, 1914–29; acting president, 1929–30; and president, 1930–37.

Dr. A. B. Rich, Jr., has been appointed assistant animal pathologist.

Ohio State University.—Dr. Charles S. Plumb, head of the department of animal husbandry from 1902 to his retirement as emeritus professor in 1931, died in Columbus on March 4 at the age of 79 years. Dr. Plumb was a native of Massachusetts, graduating from the Massachusetts College in 1882. After a year as associate editor of the *Rural New Yorker*, he became assistant in the New York State Station from 1884 to 1887, professor of agriculture and assistant director in the Tennessee University and Station from 1887 to 1890, and professor of agricultural science, animal husbandry, and dairying in Purdue University and vice director and director of the Indiana Station from 1890 to 1902. He was thus among the pioneer teachers and investigators in animal husbandry and became widely known for his services in many capacities. He was founder and editor of *Agricultural Science*, secretary and treasurer of the Society for the Promotion of Agricultural Science, 1895–99, and a member and official of many societies associated with animal husbandry and dairying in this country and abroad. Among his many publications may be mentioned his Biographical Directory of American Agricultural Scientists, 1889; Indian Corn Culture, 1895; Little Sketches of Famous Beef Cattle, 1904; Types and Breeds of Farm Animals, 1906 (revised, 1919); A Partial Index to Animal Husbandry Literature, 1911; Beginnings in Animal Husbandry, 1913; Judging Farm Animals, 1916; A Study of Farm Animals, 1922; and Marketing Farm Animals, 1927. He received many honors, including the D. Sc. degree from Massachusetts College in 1929 and Purdue University in 1935 and the LL. D. degree from Ohio State University in 1937.

Oklahoma College and Station.—Work has recently been begun on a new horticultural project entitled The Handling of Seeds of Trees and Shrubs. This project has for its purpose the development of methods of collection, appraisal, storage, and germination of seeds of economically important trees and shrubs used for afforestation on farm lands in Oklahoma, many of which germinate with difficulty in nature. The species included in this investigation are used in windbreaks and farm wood lots.

A cotton improvement program has been established in cooperation with the U. S. D. A. Bureau of Plant Industry. This program has as its objectives the conducting of tests to determine the plant and fiber characteristics and the strains and varieties best adapted to the State, the establishment and distribution of superior strains or varieties, and a study of the genetics and inheritance, fiber characteristics, and methods and technic in cotton breeding and production tests and in fiber work. As a part of the program, the Southwestern Cotton Substation has been established near Tipton in Tillman County, southwestern Oklahoma, with I. M. Parrott in charge.

W. L. Blizzard, head of the animal husbandry department since 1919, has been appointed dean of the School of Agriculture and director of the station.

Washington Station.—Dr. James Marshall, assistant entomologist at the Tree Fruit Substation, has resigned to take charge of a new entomological laboratory established by the Canadian Government in British Columbia, and has been succeeded by Dr. Joseph B. Moore, assistant in research (entomology) in the New York State Station. W. A. Junnila has succeeded Harry L. Garver, resigned, as an investigator in farm electricity in cooperation with the Washington committee on the relation of electricity to agriculture.

EXPERIMENT STATION RECORD

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THE AGRICULTURAL EXPERIMENT STATIONS IN 1938

For the great majority of the agricultural experiment stations, the fiscal year 1938 marked the close of the first half century of active operations. The attainment of this milestone is of considerable historical interest, and for this and other reasons special interest attaches to the current annual report of the Office of Experiment Stations to Congress on the stations' work and expenditures. The report, which has just become available, not only constitutes an epitome of some of the stations' individual achievements for the year under review, but discusses their collective resources, objectives, and accomplishments as members of the American research system.

The report soon makes it clear that whatever may have been the isolation and self-sufficiency of the fifty-odd State stations in the early days, the trend in recent years has been strongly toward the development and expansion of cooperation in and coordination of their work. It shows, for example, that in addition to a very substantial amount of cooperation between the State experiment stations themselves during the fiscal year 1938, there were in effect formal agreements with the Federal Department of Agriculture covering every station and aggregating 1,350 in number. These agreements, embracing nearly 1,000 major research undertakings, especially emphasized problems involving the action and adjustment programs of the Department. In no fewer than 35 States, certain phases of the national study of adjustments in farming by regions and type-of-farming areas were continued with the cooperation of the Agricultural Adjustment Administration, the Bureau of Agricultural Economics, the Forest Service, the Farm Security Administration, and the Soil Conservation Service. All of the stations cooperated in the national survey of research in soil science and related problems in connection with the 1938 Yearbook of Agriculture. Other instances of extensive cooperation had to do with research in cotton diseases, in which 12 stations cooperated as a group and with the Bureau of Plant Industry; the improvement of cereal crops, work on which was extended to include 21 States; and studies of machinery for the mechanical application of fertilizers to cotton, potatoes, sugar beets, and canning crops, and for the production and harvesting of sugar beets and corn, which involved 18 stations.

A range survey, which covered 7 distinct regions, was cooperative between 17 western stations, 4 Department bureaus, and the Department of the Interior. Cooperative soil survey work was conducted in 29 States. Other cooperative studies included the breeding and culture of potatoes in 17 States, farm population and its movements in 12 States, fertilizers and forage crops, the conformation and anatomy of the dairy cow, cereal and forage crop insects, and the quality and palatability of meat. Each of the latter studies involved 11 stations and appropriate Department bureaus.

Memoranda of understanding covering relationships in research between the Soil Conservation Service and 47 State experiment stations were effective during the year, and definite lines of soil conservation research were undertaken with 36 stations. The Bureau of Agricultural Economics likewise participated with the Soil Conservation Service in studies of the economic and social effect on farms resulting from the operation of definitely planned programs of soil conservation which were conducted in 17 States.

A project on the nutritional status of college women entered the third year of the 5-year plan at the six cooperating north-central stations. Studies on vitamin C which are active in two groups of experiment stations, one in the Northwest and one in the Northeast, afforded opportunity for comparisons between the two regions. The subject of variation in composition of vegetable foods grown in different areas of the South was made the basis for a plan of work that will integrate the work of chemists, horticulturists, and home economists of several southern stations with representatives of the Bankhead-Jones regional vegetable breeding laboratory.

This very considerable recent acceleration in the volume and effectiveness of coordinated and cooperative research may be attributed in part to the influence and opportunities afforded by the Bankhead-Jones Act of June 29, 1935. The provisions of this act for the establishment, maintenance, and operation of research laboratories in major agricultural regions have not only had the effect of promoting the integration of the research of the Department and stations along the lines of work established at the eight regional laboratories now in operation, but have also promoted group thought and action on other problems of a regional character. The allotments to States and the appropriations for special research fund projects of the Department of Agriculture have likewise greatly aided the movement toward teamwork in the solution of problems which transcend the borders of individual States and have regional or national significance.

Some of the 44 Bankhead-Jones special research fund projects of the Department of Agriculture active in 1938 were of a type most readily prosecuted in the laboratories of the bureau or bureaus concerned, but many of them also were cooperative with the experiment stations or other agencies, both public and private. Typical of the latter was the investigation of the possibilities of long-range weather and crop forecasting, including a study of the relation of weather to crop yields. The cooperative services of 11 bureaus of the Department and many of the State experiment stations have been employed in a total of 56 projects which have been initiated during the 3 years of special research fund allotments to the Department under the Bankhead-Jones Act.

The report reveals that the year was one of continued growth and consistent development of the stations themselves. Their total available income reached a high-water mark of $19,848,068, a gain of $1,791,786 over the previous maximum of 1931 and of $2,253,816 over 1937. The Federal grants to the States, Territories, and Puerto Rico rose from $5,620,000 to $6,232,500, largely because of the increase of $600,000 under the Bankhead-Jones Act, but the State appropriations were augmented in even greater proportion, and the total from all supplementary sources (including State appropriations) was $13,615,568, as compared with $12,074,253 in 1937. Thus for each dollar received from Federal sources the States appropriated approximately $1.46, and the ratio of the total supplementary income of the stations was 2.18 : 1.

The non-Federal grants were indicative of the increasing popular interest in agricultural research, as were also a number of endowments from private benefactors. Among the latter, mention is made of a trust endowment of $500,000 by the Rackham Foundation of Detroit for agricultural and chemurgic research, the income from which is to be expended by the Michigan Station, and a fund of $50,000 known as the Henry Strong Dennison Fund for Agricultural Research, which has been made available to Cornell University. Under still another bequest the Vermont Station will ultimately receive the residue of the estate of the late Alma S. Clemens of Caledonia, N. Y., now valued at approximately $20,000.

Improved facilities for research were another development of the year. Expenditures for additional equipment totaled $1,613,693 as compared with $1,252,041 in 1937. Of this amount $61,515 was expended for library purposes, a relatively small sum, but nevertheless a gain of nearly 25 percent over the previous year.

Although there was a decrease in the regular series of bulletins and circulars from 860 to 743, the output of publications showed a net gain, the total rising from 3,390 to 3,824. The major contributions were through scientific journals, which reached an aggregate of 2,510 articles. It seems apparent that the trend toward an increased utilization of this channel of communication for the presentation of technical material is continuing.

A total of 286 research projects were brought to completion during the year, but as more were begun the net result was an increase in the number active to a total of about 8,500. Of these, 505 were Adams Act projects, 1,660 Purnell, and 695 Bankhead-Jones. Practically every major field of agriculture and home economics was represented, including rural life and related interests.

Attention is directed to the change of emphasis which has characterized the station work in recent years, and which is rather significant as an indication of the responsiveness of the stations to prevailing conditions. As the report states, "while it is true that the dominant and over-all objective of experiment station research has always been the promotion of economic and social progress in agriculture and rural life, the social implications of research programs of earlier days were less clearly defined and the economic applications quite different in character than today. Of late the planning of research projects and the interpreting of results have been more consciously designed to effect the solution of economic and social problems, and recognition has been given to technical studies in the physical and biological sciences to parallel and supplement the agricultural economic and rural sociological fields as contributing factors in economic and social progress. Consequently, the sciences are being brought to bear more and more on the objectives of making farming more successful and rural life more livable under the conditions of today and those of tomorrow."

This flexibility of the station program is a feature which is not always realized by the general public. The stations are in no sense cloisters where no exigency may interrupt the timeless testing of abstract theory, but alert and practical service agencies, responsive to the needs of changing conditions. Experience during the World War of course demonstrated that without sacrifice of fundamentals they could be depended upon to reorganize their work in conformity to emergency situations, and the annals of the past decade have revealed anew the same unimpaired adaptability.

About 168 of the 200 pages of the report are utilized for a presentation of the specific accomplishments of the stations during the year, yet it is made plain that even this allotment of space "does not permit a review of the stations' contributions to new knowledge in detail or in any degree of completeness," and that the material presented is selected merely as a representative sample. This gives a clue to the great volume of work under way and demonstrates the many directions in which the stations are serving the people of the Nation. From this and other points of view the report as a whole should well repay careful study.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

A textbook of biochemistry, R. J. Williams (*New York: D. Van Nostrand Co., 1938, pp. X+525, figs.* [*21*]).—This book deals mainly with animal biochemistry and is designed primarily to meet the needs of medical students and of others with similar interests. "The skeleton upon which this book is built consists of five sections bound together by logical interrelations. They seek to answer in order the following five questions: (1) How are biochemical materials (in general) constituted? (2) Of what are our body tissues composed? (3) Which of the chemical constituents of foods are necessary for nourishment? (4) What mechanisms does the body apply in the control of chemical transformations? (5) What are the details of the process whereby the food materials are transformed into tissues with their living activities?" The contents closely follow this outline.

The application of chemistry to agriculture, C. C. Hedges and H. R. Brayton (*New York and London: D. Appleton-Century Co.*, [*1938*], *pp.* [*XI*]+*238*, [*pls. 8*]).—This is a textbook for a one-semester course for students majoring in agriculture. One year's previous work in the fundamentals of general chemistry is necessary, but organic chemistry "is not necessarily a prerequisite." The presentation of the subject is designed "to show the relationship between water, seeds and their germination, plants, the atmosphere, soils, fertilizers, insecticides, and fungicides, leaving out nonessential details and using only fundamentals."

[Chemical researches of the Bureau of Chemistry and Soils] (*U. S. Dept. Agr., Bur. Chem. and Soils Rpt., 1938, pp. 3–35*).—The Carbohydrate Research Division reports work on sugarcane juices and cane sugar manufacture, beet sugar, farm-made sorgo sirups, honey utilization, sweetpotato sirup and starch, the chemistry of cellulose, removal of water from chicory roots, and the extraction of hemicelluloses. The oil, fat, and wax laboratory discusses the composition of ouricury palm-kernel oil, American tung oil, and other vegetable oils and wax from leaves of the palm *Serenoa serrulata*. The Food Research Division report takes up citrus fruit products; apple sauce, sirup, and powder; miscellaneous fruit and berry juices and other products; frozen-pack and canning investigations with fruits and vegetables; dehydration of cull cantaloups, lettuce, and melons for stock feed; staling of bakery products; rancidity; mineral elements in food products; pickle manufacture; California walnuts (hull removal); phytochemical investigations with grapeskins and pomace, the naturally occurring fatty acids and glycerides, and the fruit of the Amur cork tree; plant viruses; preserving biological specimens; pharmacological investigations as to the possibilities of chronic poisoning by cadmium and antimony; enzyme investigations with egg white and papain; deterioration of eggs; and enzyme action at low temperature. Investigations noted by the Industrial Farm Products Research Division are on curing of hides and skins; canaigre as a tanning material; vegetable-chrome leather; utilization of sugarcane bagasse, straw, and pulping liquors; properties of lignin; fermentation investigations with cornstalks, glucose, and *l*-sorbose; motor fuel alcohol; chemical converson of oleic acid; plastics; soybean products; and production of sodium chlorate. Under the head of naval stores research the report discusses chemistry and technology of turpentine and rosin and the production and processing of naval stores. The Protein and Nutrition Research Division presents work on digestibility of soybean proteins, decystinized casein, amino acids in beans, and effects of storage on proteins of soybean and wheat products. Under the head of allergen investigations is taken up experimental work on ragweed pollen and cottonseed products. Chemical engineering research includes data on agricultural fires and their control and dust explosions.

Bibliography of the general field of agricultural chemistry.—III, Plant nutrition, H. Niklas, A. Hock, F. Czibulka, and F. Kohl (*Literatursammlung aus dem Gesamtgebiet der Agrikulturchemie. Band III, Pflanzenernährung. Weihenstephan bei München: Verlag Bodenuntersuchungsstelle, 1934, vol. 3, pp. XLV+1114*).—This volume of the classified bibliography (E. S. R., 67, p. 12) deals in four main sections, respectively, with the general literature, that concerned with the components and composition of the plant body, that dealing with the physiology of plant metabolism, and that involving the organization of agricultural experimentation. The headings and subheadings are given in English as well as in German.

Bibliography of agricultural chemistry.—IV, Fertilizers and fertilizer materials, H. Niklas, F. Ader, F. Kissel, F. Kohl, F. Czibulka, and A. Hock (*Literatursammlung aus dem Gesamtgebiet der Agrikulturchemie. Band IV, Düngung und Düngemittel. Leipzig: Heling. Verlagsanst., 1938, vol. 4, pp. XXXIX+1144*).—This bibliography is divided into four main sections dealing, respectively, with general work on manuring and fertilizers, the natural fertilizers, the commercial fertilizers, and fertilizer treatment of agricultural crop plants. The table of contents and all headings are given both in German and in English.

The purification of the anterior pituitary growth hormone by fractionation with ammonium sulfate, H. M. Evans, N. Uyei, Q. R. Bartz, and M. E. Simpson. (Univ. Calif.). (*Endocrinology, 22 (1938), No. 4, pp. 483–492*).—The authors compared adsorption with salting-out methods, finding fractionation by means of ammonium sulfate the more satisfactory. This paper details an ammonium sulfate fractionation method giving a product equal in potency to the preparations previously reported and somewhat superior in yield.

Variability in carotenoid pigment content of individual plants of Triticum vulgare and Triticum durum, M. C. Markley. (Minn. Expt. Sta.). (*Cereal Chem., 14 (1937), No. 3, pp. 400–409, figs. 6*).—Total carotenoid content of individual wheat plants when calculated as parts per million of the ground wheat meal was negatively correlated with kernel weight. Total carotenoid content of individual wheat plants when calculated as weight of pigment per kernel was positively correlated with kernel weight. Variability in kernel weight was positively correlated with the correlation between kernel weight and weight of carotenoids per kernel. A correction factor for carotenoid pigments was calculated from the regression of weight per kernel and carotenoids per kernel. Variability in carotenoid pigments per kernel was reduced nearly to the experimental error by correcting for variations in kernel weight by means of an appropriate correction factor. Mendelian ratios were not found upon examination of the carotenoid content of individual F_2 plants from crosses between varieties of durum wheat differing in carotenoid content. Multiple factor inheritance of carotenoid pigments was found in durum wheats. Highly pigmented plants were found in the F_2 population of crosses between the highly pigmented Mindum durum and the less highly pigmented Mindum × Pentad lines.

Amino acids in staple foods.—I, Wheat (Triticum vulgare), F. A. Csonka. (U. S. D. A.). (*Jour. Biol. Chem., 118 (1937), No. 1, pp. 147–153*).—Fat-free samples of flours prepared from individual wheats were extracted successively with 1 percent salt solution, with 60 percent alcohol, and with acid alcohol. The residue, containing some denatured and unextracted protein, was freed from starch by extracting with 20 percent hydrochloric acid, was hydrolyzed, and the hydrolyzate was used, like that of the other fractions, for determinations of cystine, arginine, histidine, and lysine, and of tryptophan and tyrosine.

It was shown that the individual amino acid content varies in different wheat varieties. The protein quality is much better in wheat varieties of higher nitrogen content than in those of low nitrogen. The nutritive value of the protein of whole wheat flour compares favorably with that of casein. Among the indispensable amino acids studied only tryptophan is present at a low level.

Amino acids in staple foods.—II, The effect of milling wheat on the distribution of amino acids, F. A. Csonka. (U. S. D. A.). (*Cereal Chem., 14 (1937), No. 3, pp. 397–399*).—By means of procedures noted in the preceding abstract, patent flour and whole wheat flour milled from the same samples of wheat were analyzed for their amino acid compositions. Cystine and tryptophan were higher in patent flour, while tyrosine and the dibasic amino acids were higher in whole wheat flour. The amino acid contents of the two byproducts, shorts and bran, were also determined.

Temperature effects in the preparation of wheat amylases, M. J. Blish, R. M. Sandstedt, and D. K. Mecham. (Univ. Nebr.). (*Cereal Chem., 14 (1937), No. 3, pp. 328–330, fig. 1*).—When the amylase is permitted to stand in contact with the strong alcohol from which it is precipitated for a short time, and "under reasonably cool conditions," the degree of inactivation is slight. Substantial loss of activity can occur, however, over long time intervals at excessively high room temperatures. Within a range of from 0° to 40° C., in the absence of alcohol, and at a reaction near neutrality, flour amylase, either in dispersion or as precipitated by ammonium sulfate, is stable for many hours.

Effect of fermentation, certain dough ingredients, and proteases upon the physical properties of flour doughs, L. J. Bohn and C. H. Bailey. (Minn. Expt. Sta.). (*Cereal Chem., 14 (1937), No. 3, pp. 335–348, figs. 5*).—Fermentation, shortening (within certain limits), nonfattening milk solids, and papain, when added in sufficient quantities, lowered the stress readings, as did also barley malt extract and malted wheat flour. Sodium chloride, on the other hand, markedly increased the stress readings. Good quality milk powders gave greater strength and higher stress readings than did low quality milk powders.

Factors which influence results in the wheat-meal-time-fermentation test, C. O. Swanson. (Kans. Expt. Sta.). (*Cereal Chem., 14 (1937), No. 3, pp. 419–433*).—The influence of a number of factors other than inherent wheat or flour quality are shown to affect this test. Time is lengthened by increasing fineness of grinding. Mixing also affects the time element of the test "and should be varied with the characteristics inherent in the wheat variety. This is best done by a small mechanical mixer. With the use of this machine it is also possible to add more water to obtain the optimum absorption." The temperature of the ingredients must be carefully controlled, and the fermentation must be done in a cabinet controlled within 0.1° or 0.2° C. The length of storage between grinding and testing influences the "time." It is best to make the test either the same day that the meal is ground or the day after. Effects of several other treatments and ingredients were similarly studied and reported upon.

Factors which influence the colloidal properties of dough (*Kansas Sta. Bien. Rpt. 1937–38, p. 67*).—Studies by C. O. Swanson and R. J. Clark are briefly noted.

Comparative analyses of molasses, A. T. Perkins and J. F. Merrill. (Kans. Expt. Sta. et al.). (*Kans. Acad. Sci. Trans., 40 (1937), pp. 131–133*).—The Baumé value of a molasses does not measure its sugar content. There is no relation between the sugar content of molasses and its content of moisture, ash, or organic nonsugar, or its viscosity.

The lysine content of feeding stuffs, C. A. Ayre (*Biochem. Jour., 32 (1938), No. 7, pp. 1152–1156*).—A new and relatively short method for the determination of lysine in proteins, using phosphotungstic acid as a precipitant, is reported by the National Institute for Research in Dairying. When applied to the analyses of blood meals the lysine values obtained were considerably below published values obtained by the Van Slyke procedure.

Chemical methods for the determination of vitamins and their practical significance [trans. title], **B. C. P. Jansen** (*Ztschr. Vitaminforsch., 7 (1938), No. 3–4, pp. 226, 227*).—In this introduction to a conference on the subject held in Amsterdam, April 22, 1938, the author summarizes the advantages of chemical over biological methods for the determination of such vitamins as have been identified chemically, although with the precaution that in many substances chemical determination should be checked biologically.

Methods for the determination of vitamin A and carotene in foods [trans. title], **L. K. Wolff** (*Ztschr. Vitaminforsch., 7 (1938), No. 3–4, pp. 227–239, figs. 6*).—The author first discusses the relative advantages and disadvantages of biological and chemical methods for determining vitamins, emphasizing among other points that biological tests are valueless without the use of standard preparations for comparison. The methods considered in detail are selective light absorption at 328 mμ (with directions for the saponification of oils, fats, and organs such as the liver and the preparation of peroxide-free ether) and the Carr-Price antimony blue reaction for vitamin A, the differentiation of vitamin A_2 from A, and spectrographic and chromatographic methods for determining carotene. Discrepancies between the published values for carotene in various foods are discussed, with a table giving corresponding values for a number of foods as determined by the author in terms of γ-carotene and reported by Coward and by Scheunert in International Units and in the United States as Sherman units.

The determination of ascorbic acid in plasma: A macromethod and micromethod, R. L. Mindlin and A. M. Butler (*Jour. Biol. Chem., 122 (1938), No. 3, pp. 673–686, figs. 2*).—In the methods described the Evelyn photoelectric colorimeter in its macro- and micro- forms has been used to determine ascorbic acid in blood plasma by measuring the decrease in the concentration of 2,6-dichlorophenolindophenol produced by the addition of an amount of plasma insufficient to cause complete reduction of the dye. The error from fading of the dye is prevented by adding an amount of sodium acetate sufficient to bring the pH of the final plasma filtrate to 4.1, a value which is considered high enough to prevent significant fading and low enough to prevent immediate reduction of the dye by reducing substances other than ascorbic acid which may be present in the plasma. The oxidation of the reduced ascorbic acid except by the dye reagent is thought to be prevented by the addition of cyanide to the blood immediately upon collection, by the addition of metaphosphoric acid to the plasma filtrate before the addition of the acetate dye solution, and by the short time required for the procedure.

The apparatus, reagents, and technic for both macro- and micromethods are described in detail, with tabulated data showing good agreement in values obtained with the same samples by both methods in comparison with the Pijoan and Klemperer titration method and also with simultaneous samples of venous and capillary blood from the same subject as determined by the macro- and micromethods, respectively. For the macromethod from 4 to 5 cc. of venous blood is required and for the micromethod from 0.2 to 0.3 cc. of capillary blood. It is stated that with the microapparatus satisfactory results can be obtained from as little as 0.1 cc. of plasma.

"New use" research [of the U. S. Department of Agriculture] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1938, pp. 114–119*).—The report notes numerous developments in utilization of crop wastes, work on naval stores, drying oils, industrial sweetpotato starch, and other materials.

Apricot, peach, and plum juices, W. V. Cruess (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16 (1937), No. 8, pp. 231–233, figs. 3*).—The author briefly summarizes present trends in the fruit-juice market and outlines commercial procedure, based on successful smaller scale packs.

Prune juice, E. M. Mrak. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16 (1937), No. 8, p. 230*).—A commercial scale process for the preparation of a juice favorably received by consumers is discussed. The flavor may be improved by acidifying with from 0.3 to 0.4 percent of citric acid or with an equivalent proportion of terpene-free lemon juice. If cans are used they should be of type L or similarly resistant plate. Enamel lining is not necessary.

Retaining flavor and vitamin content in fruit juices, M. A. Joslyn. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16 (1937), No. 8,* pp. *234–236, fig. 1*).—It is necessary to use freshly packed, sound, mature fruit; to extract the juice so that there is the minimum of contamination with undesirable metals, undesirable fruit tissue constituents, and air; to inactivate the enzymes responsible for oxidative changes or inhibit their activity by avoiding contact with air; to process the fruit juice so that there is the minimum effect on flavor and the least loss of volatile flavoring constituents; and to pack the juice in inert containers and to cool promptly and store the juice in a cool place. The retention of nutritive values closely parallels that of flavor.

Carbonated fruit juices in cans, R. Celmer and W. V. Cruess. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16 (1937), No. 8, pp. 229, 251*).—In the berry enamel cans and in wax-lined beer cans the juices held their flavor and color very well. The authors believe that these cans (if the berry enamel cans are made of heavy plate, as for beer cans) would hold carbonated grape juice satisfactorily, especially if it were stored under refrigeration and not allowed to remain on the retailer's shelves at room temperature for long periods.

The relation of clarifying and sterilizing treatments to sedimentation of apple juice, R. E. Marshall. (Mich. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16 (1937), No. 11, pp. 328, 329, 331, fig. 1; abs. in Michigan Sta. [Bien.] Rpt. 1937–38, p. 32*).—Apple juice that has been subjected to the Pectinol enzymic clarification should either be flash pasteurized before bottling or subjected to the ordinary pasteurization in bottles. Those desiring to use the cold sterilization or germproofing filtration should not clarify with Pectinol. Apple juice to be sterilized by this method should be clarified with gelatin and tannin or by flash heating the juice.

Preserving cider by carbonation, H. D. Brown and C. W. Foulk (*Ohio Sta. Bimo. Bul. 196 (1939), pp. 5, 6*).—Various methods of preparing carbonated ciders were tested, the best results having been obtained by adding to 12-oz. bottles 4, 5, or 6 oz. of a 26 percent sugar concentrate from frozen and centrifuged cider and filling with carbonated water. Preservation was satisfactory at the end of 3 months' storage (no microscopic evidence of molds or yeasts). The flavor was highly carbonated but deemed excellent by those who tasted the product. Either 4 or 5 oz. of the concentrate proved better than 6 oz.

AGRICULTURAL METEOROLOGY

Weather reports and investigations (*U. S. Dept. Agr., Sec. Agr. Rpt., 1938, pp. 105–109*).—Summaries are included of the rainfall and general weather conditions of the country in recent years, including 1938; of progress on the work of the Department relative to long-range weather forecasting (cooperative in part), studies of hot and cold waves, and the expansion of the flood service.

Monthly Weather Review, [September–October 1938] (*U. S. Mo. Weather Rev., 66 (1938), Nos. 9, pp. 263–310, pls. 10, figs. 12; 10, pp. 311–349, pls. 11, figs. 11*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, bibliographical and other information, these numbers contain an article noted on page 732 and the following contributions:

No. 9.—On the Use of Vertical Cross Sections in Studying Isentropic Flow, by C. H. Pierce (pp. 263–267); A Practical Method for Computing Winds Aloft From Pressure and Temperature Fields, by E. M. Vernon and E. V. Ashburn (pp. 267–274); The Hailstorm of April 1938 at Washington, D. C. (including Unusual Fall of Large Hailstones at Washington, D. C., by G. Slocum, The Formation of Irregularly Shaped Hailstones, by D. L. Arenberg, Note on the Hailstones of August 9, 1938, at Williamstown, by W. I. Milham, and The Structure of Hailstones, by R. P. Johnson) (pp. 275–277); Rains in Kansas, by A. D. Robb (pp. 277–279); The Duration and Intensity of Twilight, by H. H. Kimball (pp. 279–286); and Hurricane of September 16 to 22, 1938, by I. R. Tannehill (including data on tropical storms in New England, the hurricane of 1938 at sea, the hurricane in coastal areas and in New England, destructive effects of the hurricane, the inundation, damage and loss of life, and warnings) (pp. 286–288).

No. 10.—Tropical Disturbances of October 1938, by J. H. Gallenne (p. 325).

Hyperbolic dividers for geostrophic wind computations, A. F. Spilhaus (*Bul. Amer. Met. Soc., 19 (1938), No. 8, pp. 351–353, figs. 2*).—The instrument is described and illustrated.

The design and performance of radio equipment for radio-meteorographs, C. B. Pear, Jr. (*Bul. Amer. Met. Soc., 19 (1938), No. 7, pp. 299–309, figs. 9*).—For records to the height of 20 km and at a maximum horizontal distance of 150 km reached while attaining this height, and using superregenerative receivers, the elementary transmitter described and illustrated is said to be capable of producing satisfactory results if sufficient insulation is provided to keep battery temperature above −22° C. It is claimed that if the output remained unchanged and if the balloon rose fast enough to stay above the horizon, the transmitter would send recordable signals for a distance of 450 km.

The lag coefficients of some meteorological thermometers, W. E. Knowles Middleton, H. W. Edwards, and H. Johnson (*Bul. Amer. Met. Soc., 19 (1938),* *No. 8, pp. 321–326, figs. 2*).—The lag coefficients of a number of instruments used in meteorology for measuring temperature were determined, the dependence of this lag on ventilation is discussed, and a practical application to the measurement of fluctuating temperatures is suggested.

On verifying weather forecasts, H. H. CLAYTON (*Bul. Amer. Met. Soc., 19 (1938), No. 8, pp. 341–343*).—The author presents a mathematical formula for verifying forecasts, with discussion of the underlying principles of the method. Partial success is measured by the difference in the frequency of occurrence of the forecasted condition when it is forecasted and when it is not. The greater the difference, the greater is the success.

Local forecasting of heavy winter precipitation at Blue Hill, I–III, H. G. DORSEY, JR. (*Bul. Amer. Met. Soc., 19 (1938), Nos. 7, pp. 281–297, figs. 13; 8, pp. 335–339, figs. 2*).—In parts 1 and 2, the author presents a study and analysis of seven great winter-type (1933–38) and two spring-type snowstorms (1933–35), respectively, in eastern Massachusetts from the special viewpoints of causes and local forecasting. Part 3 discusses the use of Mt. Washington data in short-term forecasting for the Boston area. Taken in connection with the heavy-snowfall data, the results appear to indicate that the most successful use of the Mt. Washington data in short-range forecasting comes after the local meteorologist makes a careful analysis of the general synoptic situation accompanying an expected period of precipitation. When the probable direction of the TM flow has been determined, the six-hourly reports from the mountain should give advance warning of its arrival or its nonappearance over New England. The type of accompanying precipitation should also be suggested. It is believed that the methodology should be applicable locally to practically all cases of precipitation during the winter season, and the present results may well apply to all rain or snowfall in moderate amounts.

Air masses and fronts in South America, P. E. JAMES (*Geog. Rev., 29 (1939), No. 1, pp. 132–134, figs. 2*).—This is a résumé of data obtained through the work of the Serviço Meteorologico Brasileiro under the direction of A. Serra and L. Ratisbonna, considering equatorial, tropical, and polar air masses and the drought region of northeastern Brazil, which is described in terms of this air mass distribution.

Hurricanes into New England: Meteorology of the storm of September 21, 1938, C. F. BROOKS (*Geog. Rev., 29 (1939), No. 1, pp. 119–127, figs. 4*).—The basic factors in the 1938 hurricane and details of its production and progress are enumerated and described, and the hurricane hazard in New York and New England is discussed. The conditions under which a West Indian hurricane will strike the North Atlantic coast with full vigor are said to be that (1) the general pressure gradient from east to west must be great throughout the troposphere, (2) the terrain in front of the storm must be well bathed in moist tropical air, and (3) the storm must remain over the open sea all the way from the West Indies to its northern landfall. It is also first necessary that the general winds in the middle levels of the troposphere shall be directed essentially northward or perhaps northwestward, so as to give the storm a movement from the south or southeast. Among the lessons taught by this catastrophe is the need for certain suggested improvements in the hurricane observing and warning services.

Australian rainfall in sunspot cycles, E. T. QUAYLE (*Austral. Bur. Met. Bul. 22 (1938), pp. 56, pls. 6*).—The variability of rainfall in Australia, particularly in the marginal agricultural areas and the strictly pastoral interior, has given a strong incentive to the study of any correlations that might appear useful for the estimation of probable seasonal rainfall. Here the author presents extensive tabulated data relative to distinguishing between the responses of summer and winter seasons, and to showing how far the successive sunspot cycles approximate to the mean relationships in phase and amplitude. The discussion is confined to seasonal effects. A table of sunspot numbers is included.

Australian rainfall in district averages (*Austral. Bur. Met. Bul. 23 (1938), pp. 56, pls. 2*).—The complete sequence of district averages in rainfall derived from the totals at those stations reporting daily by telegraph is here presented for the first time since the initiation of the practice in 1913.

The Ohio River flood of 1937, W. C. Devereaux. (U. S. D. A.). (*Bul. Amer. Met. Soc., 19 (1938), No. 8, pp. 330–332*).—Following a descriptive discussion of this flood it is stated to have been an outstanding example of the direct and almost immediate relation between rainfall and stage height. If, as a result of a complete analysis of the atmospheric conditions, forecasts of heavy or excessive precipitation had been sent to the river-forecasting centers, the stage forcasts would have been much more accurate. The stream flow was only a minor factor, and there was no time to use stream-flow readings for forecasting the flood stages, and frequently insufficient time to collect measurements of the rainfall.

The 1937 freeze in California, F. D. Young (*U. S. Mo. Weather Rev., 66 (1938), No. 10, pp. 311–324, pls. 2, figs. 10*).—A general discussion of climatic conditions in California and the history of previous freezes and their backgrounds is followed by detailed accounts of the two freezes of January 1937, including the forecasts and their value, damage caused by the freeze, and general aspects of the freeze.

Corn culture and climate in the so-called corn triangle of the Union of South Africa, G. H. Scheepers (*Maisanbau und Klima im sogenannten Maisdreieck der Südafrikanischen Union. Hamburg: A. Preilipper, 1938, pp. 70, figs. 29*).—This monograph considers the importance, position, and limits of the region investigated; the climatic phenomena (rainfall, temperature, and sunshine) of the area in relation to the culture and harvesting of corn; and the instability of the corn-growing industry therein.

SOILS—FERTILIZERS

[Soil and fertilizer investigations of the Bureau of Chemistry and Soils] (*U. S. Dept. Agr., Bur. Chem. and Soils Rpt., 1938, pp. 35–44*).—Fertilizer researches mentioned in the report have included catalyst and high-pressure investigations; X-ray studies on the structure of soil minerals and other fundamental physical and chemical investigations; work on nitrogenous fertilizer materials, including ammoniated peat and urea; biochemical and organic nitrogen investigations, especially with *Azotobacter;* work on phosphates (fluorine content, properties of superphosphate and the accompanying calcium sulfate, and fixation in different types of soil); potash salts and byproducts; and mixed-fertilizer investigations. Soil chemistry and physics research has resulted in data on variations in limestone, alluvial, subtropical, and desert soils; the effect of the composition of the soil on plants; selenium in soils; physical properties of soils; mineral composition of soil colloids; structure of peat; and quick chemical tests for soils.

[Soil and fertilizer investigations of the Bureau of Plant Industry] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1938, pp. 2, 19, 20, 24*).—The soil fertility investigations have included studies of nitrate accumulation in wheatland, testing of new compounds for fertilizer value and studies of the efficiency of soluble nitrogen increased in non-acid-forming fertilizers and of organic phosphates available to plants. Soil microbiological investigations have shown the unsatisfactory results of dry legume inoculation and the destructive action of the ameboid phase of *Dictyostelium* on other soil micro-organisms. The report also notes gallium as one of the elements of which traces are essential for plant growth and takes up the control of boron injury by the elimination or dilution of contaminated irrigation waters.

Report of the Chief of the Soil Conservation Service, 1938, H. H. Bennett (*U. S. Dept. Agr., Soil Conserv. Serv. Rpt., 1938, pp. 55*).—Some topics taken up in this report are erosion control practices (including winter cover crops, modifications in strip cropping, orchard mulching, and pasture, woodland, wildlife, and range management), advances in engineering technics, determination of soil and water losses under cultivation and protective cover, sedimentation studies, and the progress of various surveys.

[Soils and soil erosion control at the Arkansas Station] (*Arkansas Sta. Bul. 368* (*1938*), *pp. 28–32, fig. 1*).—Soil management erosion control experiments at the main station farm and role of potassium are reported upon by R. P. Bartholomew; productivity of Ruston fine sandy loam, by O. R. Younge; and outlying fertilizer experiments, by Bartholomew and Younge.

[Soil investigations by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1937–38, pp. 43–47, 125*).—The topics taken up in the report are soil-fertility investigations, by W. H. Metzger; influence of the absolute reaction of the soil solution upon the growth and activity of *Azotobacter*, by P. L. Gainey; influence of legumes and nitrogen-fixing organisms on the growth of plants and on the nitrogen balance, by H. E. Myers; a study of the soil solution as governed by H-ion concentration and other factors and a study of some replaceable cations and anions in some Kansas soils, both by A. T. Perkins; and soil and water conservation studies, by F. G. Ackerman.

[Soil and fertilizer investigations by the Maryland Station] (*Maryland Sta. Rpt. 1938, pp. 26–28, 30, 31–33, figs. 3*).—The report contains notes on the effect of organic matter on the fertility of Leonardtown loam, field studies of the fertility requirements and management of important soil types, the Princess Anne field, the Ridgely fertility plats, efficiency of soil fertility management, rapid soil testing, a laboratory study of some soils from the Ridgely field, and chemical studies of the causes of the hardpan in Leonardtown soils.

[Soil and fertilizer investigations by the West Virginia Station] (*West Virginia Sta. Bul. 290* (*1938*), *pp. 17, 18*).—A more or less general need for phosphates in West Virginia soils is noted by G. Pohlman.

Putting soil science to work, E. Truog (*Jour. Amer. Soc. Agron., 30* (*1938*), *No. 12, pp. 973–985, fig. 1*).—This is a largely historical discussion, previously noted (E. S. R., 80, p. 288).

Soil erosion in the karst lands of Kentucky: Physiographic conditions affecting erosion and land use in areas underlain by soluble limestone, S. N. Dicken and H. B. Brown, Jr. (*U. S. Dept. Agr. Circ. 490* (*1938*), *pp.* [*2*]+*62, figs. 35*).—The various types of karst land (the name being taken from that of a limestone area on the eastern Adriatic coast) are described, attention being called to the special forms of erosion induced by gradual solution of underlying limestone with the resultant formation of "solution depressions similar to rude cisterns, hornlike funnels, and broad, shallow basins. Surface watercourses and true valleys are almost absent, since the run-off quickly flows or seeps downward in the hollows and drains away through the extensive underground circulation." It is noted that more than 5 million acres of the southeastern United States farm lands are subject to destructive erosion due to karst land conditions. Adaptations of the usual methods of erosion control to the peculiarities of contour and erosion mechanism which characterize karst lands are discussed. It is noted that much of the Kentucky karst is productive land, but it cannot remain productive under row cropping and other practices not adapted to its specialized conservation requirements.

Erosion and related land use conditions on the Froid demonstration project, Montana, W. C. BOATRIGHT (*U. S. Dept. Agr., 1938, pp. 28, pls. 3, fig. 1, map 1*).—A soil conservation survey of the Froid demonstration area, about 32,000 acres in Roosevelt County, Mont., indicated moderate wind-erosion damage to 9,850 acres, or 31.7 percent. Severe damage was found on only 463 acres. On 18,600 acres slight erosion damage was found, and no evidence of accelerated erosion on 2,184 acres. Practically the entire area is subject to erosion, however, and is in need of protection. Control can be accomplished, it is stated, by proper land use, careful tillage, crop rotations, contour or wind strip cropping, moisture-conservation practices, windbreak plantings, good management of ranges and pastures, and the utilization of crop residues.

Erosion and related land use conditions on the Reedy Fork demonstration area, North Carolina, W. W. STEVENS, H. V. BRAGG, E. C. SEASE, and O. C. LEWIS (*U. S. Dept. Agr., 1938, pp. 21, pls. 3, fig. 1, maps 2*).—A conservation survey of 47,483 acres, mainly in Guilford County and a small part in Forsyth County, N. C., is reported. Erosion is serious in all parts of the area. A total of 87.5 percent of the land has been subject to accelerated erosion, damage being slight on 12.5 percent, moderate on 40.3, and greater than moderate on 34.7 percent. An area of 2,239 acres has been damaged to such an extent that further tillage is impractical. Most of this erosion has taken place during the last 50 yr. as a consequence of the clearing of steep hillsides and the spread of intensified row cropping. Soil conservation is largely a matter of readjusting land use to fit natural conditions. All D slopes (in this survey, over 12 percent slope, steep and broken) and severely eroded areas should be retired from cultivation. Crops should be grown on the most suitable soils, and crop rotation, strip cropping, contour tillage, terracing, deep plowing, and the use of legumes and cover crops should be generally practiced. These practices, however, are only part of a complete program.

The land in flood control (*U. S. Dept. Agr., Misc. Pub. 331* [*1938*], *pp.* [*2*]+*38, figs. 21*).—This is a popular account of the problem of flood control and its dependence upon soil, vegetation, and forest conservation, some of the topics taken up being concerned with the role of vegetation in flood control; the extent of vegetal depletion; limitations of vegetal control; the threat of erosion to dams, reservoirs, and other engineering works; procedures under Flood-Control Acts; watershed surveys; nature of watershed measures; and the necessity of teamwork. Pictorial comparisons of good and bad practices are included, together with an appendix presenting the "chronology of flood-control mandates to the Department of Agriculture."

Relation of certain water and soil conservation practices to crop production.—A summary, R. E. DICKSON and B. C. LANGLEY. (Tex. Expt. Sta. and U. S. D. A.). (*Southwest. Sheep and Goat Raiser, 7 (1937), No. 14, pp. 6, 22*).—Average annual inches of water and tons of soil lost during 11 yr. from lands having slopes of from 0 to 3 percent and under various crops and control treatments are tabulated, and these data, together with the control measures tested, are discussed.

The establishment of soil colour standards, C. F. SHAW. (Univ. Calif.). (In *Transactions of the First Commission of the International Society of Soil Science. Bangor, Wales: Internatl. Soc. Soil Sci., 1938, vol. A, pp. 51–53*).—

The author briefly summarizes previous work, including his own color disk method (E. S. R., 67, p. 212), and presents the conclusion of the committee on soil color which "believes it possible to establish standards of soil colors with acceptable degrees of permissible variations from these standards and, by cooperative effort, to secure agreement among soil scientists on the name that shall be used for each of these color conditions."

On the formation of structure in soil.—VI, Method of microscopic investigation of soil structure in reflected light, D. I. SIDERI (*Soil Sci., 46 (1938), No. 4, pp. 337–349, pls. 2*).—In the present paper of this series (E. S. R., 80, p. 304), the author describes a method in some way similar to that of Harper and Volk (E. S. R., 79, p. 303). Xylene solutions of resins as cementing media were used instead of nitrocellulose "lacquers", and surfaces for opaque illumination rather than sections for examination by transmitted light. The author finds that "the method of studying structure in reflected light by means of polished sections can be applied to the solution of a number of practical questions bearing on agrotechnical methods and the use of fertilizers. The method proved very sensitive in observations on structure changes and can, therefore, be used as a control and for purposes of comparison with other methods of soil structure analysis. . . . Microscopic study of structure may be utilized for the explanation of questions bearing on the genesis of soils, and particularly those on soil morphology. In problems of morphogenesis and in establishing the relation between the form of structural varieties and the inherent properties of soil, this method may be of considerable service and may be of help in obtaining knowledge of the properties of soil."

Report of the committee on physics of soil-moisture, 1937–38: Effect of organic matter on the infiltration of water into soils, F. J. VEIHMEYER. (Univ. Calif.). (*Amer. Geophys. Union Trans., 19 (1938), pt. 1, pp. 326–342*).—This report consists of answers, condensed by the author, obtained in reply to a questionnaire sent to various investigators.

Humidity and specific gravity of soil particles, A. T. PERKINS, L. HORNE, and H. H. KING. (Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans., 40 (1937), pp. 127–129*).—The authors show that quantities of water sufficient to affect materially the percentages of the various specific gravity fractions may be adsorbed on the particles of the fractions, the greater proportions of adsorbed water being taken up by the finer fractions. In samples held over 95 percent sulfuric acid the differences between coarser and finer fractions are shown to be small, but over sulfuric acid of a concentration of a little more than 52 percent the 56μ fraction gained 0.18 percent moisture, whereas the 6μ fraction gained 0.89 percent. When the sulfuric acid concentration was a little more than 35 percent the gains were 0.33 and 1.59 percent, respectively. The corresponding behavior of fractions of intermediate size is also shown. As a result of such differential adsorptions the percentage of the soil material in the 2.3 to 2.5 sp. gr. fraction was decidedly increased at the expense of that falling into the 2.5 sp. gr. fraction.

A mechanical device for determining the permanent wilting point of soils by means of the cohesion method, G. J. BOUYOUCOS. (Mich. Expt. Sta.). (*Soil Sci., 46 (1938), No. 4, pp. 331–335, pl. 1*).—The principle of the method is that at or above the wilting point the soil moisture film is sufficiently thick to cause the soil particles and granules to cohere when lightly pressed together, but below the wilting point the moisture film becomes too thin and discontinuous and is held with such great attractive forces that no such cohesion occurs. As first described (E. S. R., 79, p. 18), the method involved pressure applied by means of a spatula held in the hand. The present procedure substitutes metal rollers pressing upon the soil by their own weight only in order to provide a more nearly constant pressure.

Oxidation-reduction potentials in soils, A. N. Puri and A. Sarup (*Soil Sci., 46 (1938), No. 4, pp. 323–329, figs. 3*).—The so-called oxidation-reduction potential in soils is shown as a fundamental property of all colloidal substances which furnish ionic micelles and behave as acidoids. "The relation between pH and Eh in soils is so perfect that the measurement of pH should suffice for all practical purposes." It is further pointed out that "only a small quantity of quinhydrone is required to stabilize the pH-Eh relation in a solution, and this principle forms the basis of pH determinations by the quinhydrone electrode. Similarly, a small quantity of a colloidal solution that behaves as an acidoid could be used for measuring the pH value of solutions. The possibility of developing such an acidoid electrode for pH measurements should be explored. . . . Such an electrode would cover the alkaline range up to pH 10 and would thus be superior to the quinhydrone electrode."

Effect of "alkali" salts on general microbial function in soil, W. B. Bollen and S. M. Ahi. (Oreg. Expt. Sta.). (*Soil Sci., 46 (1938), No. 4, pp. 287–305, figs. 3*).—Decomposition in an artificially salinized soil and in a natural Solonetz under laboratory conditions was studied by establishing a carbon balance which accounted for changes in carbonate and bicarbonate as well as for carbon dioxide evolution. In a slightly acid soil from the subhumid Willamette Valley region, treated with various alkali salts and incubated in a laboratory respiration apparatus for 164 days, all the salts depressed the rate of decomposition of the native soil organic matter as well as that of added straw. Sodium chloride was most depressive; sodium sulfate, least depressive; and magnesium sulfate and sodium carbonate were intermediate in effect. Nitrate accumulation was retarded in about the same order as carbon dioxide evolution. Sulfur oxidation was not influenced by sodium chloride or sodium carbonate. Water-soluble phosphate was indirectly influenced, being decreased as pH was increased. In a virgin alkali soil and in its reclaimed counterpart reclamation had little permanent influence on the native microflora and their activities. Microbial response of the virgin soil to various additions was similar to that of the reclaimed soil, but the latter was superior in sulfur-oxidizing capacity. The virgin soil nitrified dried blood and decomposed straw more effectively but was less effective in nitrifying ammonium sulfate and in decomposing glucose. Normal carbonate was completely eliminated from the virgin alkali soil by sulfur oxidation, 70 percent was eliminated as carbon dioxide, and 30 percent was transformed to bicarbonate. Oxidation of native and added organic matter, as well as nitrification, produced similar but less extensive carbonate transformation. Bicarbonates in the reclaimed soil were reduced from 40 to 70 percent by microbial activity.

Further studies of Bacterium globiforme and the incidence of this type of organism in Canadian soils, C. B. Taylor (*Soil Sci., 46 (1938), No. 4, pp. 307–321, pl. 1, fig. 1*).—Of 90 soils examined, selected from widely separated points of Canada, 89 showed the presence of *B. globiforme*. Numbers of this organism show no relationship to fertility but may be greater in fertile soils than in infertile soils, since fertile soils usually support a higher general bacterial population.

In virgin, prairie, garden, orchard, woodland, and mixed cropped soils, provided these soils are more alkaline than pH 5.0, *B. globiforme* is present in large numbers. Where application of fertilizer results in an increase in numbers of *B. globiforme*, the increase is not a preferential stimulation of this group but is proportional to the increase in total plate count. In soils more acid than pH 5.0 the organism is severely repressed. The application of lime to such soils increases the numbers of *B. globiforme* in preference to other types.

The morphology of several strains of *B. globiforme* has been compared during growth on artificial media and in the soil. Certain pleomorphic forms observed in laboratory media have not been found to occur in soil.

Thirty years of soil fertility investigations in South Dakota, J. G. Hutton (*South Dakota Sta. Bul. 325* (*1938*), *pp. 110*, *figs. 52*).—General fertilizer experiments at Brookings, Cottonwood, Eureka, and Highmore, in which nitrogen, phosphorus, and potasium fertilizers were applied singly and in combinations, are reported upon, together with manure, phosphate, and limestone trials and grain and livestock farming systems at Brookings.

At Brookings, phosphorus alone gave an increase of 27.59 percent of dry matter. Potassium alone gave an increase of 1.55 percent, but had a depressing effect when applied with other elements. At Cottonwood, an increase of 9.74 percent followed potassium fertilizers. The decrease following nitrogen was 3.48 percent. At Eureka, the only increase, 0.78 percent, followed the use of nitrogen, phosphorus, and potassium. The lowest yield followed the application of phosphorus alone, a decrease of 6.7 percent. At Highmore, potassium alone caused a decrease of 2.52 percent, while a 16.83 percent increase followed the application of nitrogen and phosphorus in combination. In manure, phosphate, and limestone trials at Brookings, for 25 yr. the application of 10 tons of manure per acre every 4 yr. in the rotation was followed by an increase in yield of total dry matter of 17.14 percent. The application of acid phosphate with manure increased the yield 2.17 percent over manure alone, a total increase over the yield following no treatment of 19.31 percent. Rock phosphate with manure seems to have decreased the beneficial effects of manure alone by 3.17 percent. Limestone alone was followed by an increase of 2.34 percent, but with manure or manure and acid phosphate it has reduced the beneficial effects observed where these substances were applied without it. Limestone with rock phosphate gave an apparent increase of 0.62 percent over rock phosphate alone. In grain and livestock farming systems at Brookings, all treatments were followed by higher yields of total dry matter than those following no treatment. An increase of 13.64 percent followed the application of manure, and phosphorus and potassium with manure gave lower yields than manure alone. Plowing under crop residues with sweetclover and peas did not prove as effective as manure. Phosphorus or phosphorus and potassium with the residues increased the yields over those following the residues alone but did not equal the yields following manure alone. The water required to produce 1 lb. of dry matter on the plats receiving no treatment was Brookings 1,593 lb., Cottonwood 2,086, Eureka 1,323, and Highmore 1,638 lb.

Pecan soils of the Gulf and Southeastern States and maintenance of their fertility, J. J. Skinner, E. D. Fowler, and A. O. Alben (*U. S. Dept. Agr. Circ. 492* (*1938*), *pp. 24*, *figs. 2*).—In a survey of the lands used for pecans, the crop was found on two major groups of soils, upland soils and valley-land or stream-bottom soils. Ninety-nine percent of native pecans are on stream-bottom soils, but 90 percent of improved varieties were found on upland soils. The crop was found growing in 31 different upland soil series and 24 valley-land soil series, but 95 percent of the upland soil pecans were found on Ruston, Norfolk, Tifton, Orangeburg, Greenville, Red Bay, and Cecil series, while 80 percent of the native pecans were on the Miller, Yahola, Sharkey, Sarpy, Trinity, Pledger, Catalpa, Cahaba, and Kalmia soil series. The upland soils in general respond to fertilizer treatment, giving larger yields and more vigorous trees. Some soil types responded only to nitrogen and others to nitrogen and potassium compounds, but most soils needed a complete fertilizer. Fertilizers found suitable are suggested. Winter green-manure crops followed by cultivation in the spring and early summer and a late summer green-manure crop maintained soil-fertility factors better than did other practices.

Soil organic matter and the living plant, A. W. Blair and S. A. Waksman (*New Jersey Stas. Bul. 653 (1938), pp. 20, figs. 11*).—This bulletin presents a popular summary of the mode of formation, the nature, and the essential functions of the soil organic matter or humus, together with its maintenance and its relation to soil conservation.

The effect of sheep and goat manure on some Mediterranean red soils, M. Puffeles and S. Adler (*Soil Sci., 46 (1938), No. 4, pp. 273–278*).—The decomposition of the manure, as indicated by the C : N ratio, appears to have been completed in 6 mo., under laboratory conditions in which the soil was kept at constant moisture content. The C : N ratio of "humuslike" substances and the increase of the value of exchangeable bases as a result of the proportional increase of C are similar to results obtained by other investigators.

Commercial fertilizers: Their sources and use, G. H. Collings (*Philadelphia: P. Blakiston's Son & Co., [1938], 2. ed., pp. XVII+456, figs. 109*).—This is a textbook for agricultural college use. Previous courses in botany, chemistry, geology, soils, and agronomy are assumed. The chapter headings are origin and development of the use of commercial fertilizers; source, production, and use of sodium nitrate; manufacture and use of ammonium sulfate; manufacture and use of the synthetic nitrogenous fertilizers; sources and uses of organic nitrogenous fertilizers; sources and use of the mineral phosphates; sources and uses of bone phosphate and basic slag; manufacture and use of the superphosphates; production, manufacture, and use of the German and French potash salts; American sources of potash fertilizers; sources and uses of fertilizers carrying essential elements other than nitrogen, phosphorus, and potassium; fertilizers carrying elements not accepted as essential for plant growth; principles underlying the purchase of fertilizers; principles underlying the use of fertilizers; the application of fertilizers and the influence of fertilizers on germination and seedling growth; and adjusting soil reaction and fertilizer practice to crop requirement. A bibliography, authors' index, and general index conclude the volume.

Fertilizer materials and mixed fertilizers, A. W. Blair (*New Jersey Stas. Bul. 651 (1938), pp. 42, figs. 10*).—"On account of the important changes that are taking place in the field of fertilizer manufacture and practice, it has seemed worth while to prepare a publication in which the situation is brought up to date, listing the materials that are now available for use, with a brief account of methods of preparation and use." This bulletin takes up elements supplied by fertilizers, functions of fertilizer elements, sources of plant food, mixed fertilizers, high analysis fertilizers, methods of applying fertilizers, fertilizers and crop injury, fertilizers and soil reaction, spray residues and soil reaction, fertilizers for different crops, residual effects of fertilizers, and soil analysis and the use of fertilizers.

Approved fertilizers for different crops grown in North Carolina (*North Carolina Sta. Agron. Inform. Circ. 116 (1939), pp. 13*).—This circular states the fertilizer formulas found suitable for numerous crops as grown on each of the more important soil groups of the State, giving also the quantity required per acre on the assumption of an average degree of fertility.

Beneficial interactions in fertilizers for orchards, F. W. Hofmann. (Va. A. and M. Col.). (*Va. Fruit, 25 (1937), No. 2, pp. 18–23, figs. 5*).—Experiments carried out in an overcrowded and ill-maintained orchard over a 3-yr. period indicated that, as compared to calcium cyanamide used alone, the results were 3 times better for calcium cyanamide with potassium sulfate, 3.5 times for calcium cyanamide with acid phosphate, and 4 times higher with these fertilizers applied together. Improvement not only in the condition of the trees but also in the vigor of growth of the native cover was obtained.

Manganese salts and sulphur for alkaline mucks (*Michigan Sta. [Bien.] Rpt. 1937–38, p. 37*).—Experiments showing the effectiveness of these elements are briefly noted.

Inspection of commercial fertilizers, H. D. HASKINS (*Massachusetts Sta. Control Ser. Bul. 95 (1938), pp. 51*).—This 1938 report of fertilizer analyses shows, among other points of interest, that of the total tonnage of mixed fertilizer sold in Massachusetts 62 percent was from grades recommended by New England agronomists to meet New England conditions (the "New England Standard Nine" grades), and 22 percent additional tonnage was from grades varying but 1 percent in one or more plant food elements from the grades thus recommended.

Analyses of commercial fertilizers, J. T. SPARLING and E. BURKE (*Montana Sta. Bul. 364 (1938), pp. 13*).—This bulletin presents and discusses the State fertilizer law as revised in 1935, tabulates the analytical results for 1938, and illustrates the calculation of fertilizer cost on the basis of actual plant food obtained.

AGRICULTURAL BOTANY

An introduction to botany, A. W. HAUPT (*New York and London: McGraw-Hill Book Co., 1938, pp. XII+396, [pl. 1], figs. 278*).—In this introductory college textbook the author has attempted a balanced treatment, with the emphasis on morphology but with considerable attention also on the physiological processes—stress being laid on the concept of the plant as a living thing. The structure and functions of the vegetative organs of seed plants precede accounts of the organs concerned in reproduction and dispersal. Environal relations and breeding are each given a chapter, and a survey of the great plant groups is presented in the usual way by a series of forms gradually increasing in complexity. Special attention is given to evolution, heredity, adaptation, and other topics of general biological interest. Gross aspects are presented before the minute features of structure. The general plan follows the historical development of botany as well as the organization of advanced work in the subject.

[Botanical work by the Maryland Station] (*Maryland Sta. Rpt. 1938, pp. 56–58*).—Progress reports are included on the time rate of oxygen respiration in some cereals (kernels) in relation to total natural and imbibed water and to the ratio of free and bound water; and the relation between vernalization and the activity of plant growth regulators, flowering substances, etc.

Research in botany and bacteriology (*Montana Sta. Rpt. 1937, pp. 22, 23*).—Brief summaries are given of work on wheat smut control; barberry eradication and black stem rust of wheat (coop U. S. D. A.); and wheat root rot and apple scab control.

The use of the Feulgen technic with certain plant materials, T. W. WHITAKER. (U. S. D. A.). (*Stain Technol., 14 (1939), No. 1, pp. 13–16, figs. 2*).—The Heitz modification of the Feulgen technic is said to give promise as an extremely useful tool in solving certain cytological problems, and a procedure for using it with root tip and plant microspore smears is outlined. The chief improvement suggested is that the material be mounted in euparal after immersion in 95 percent alcohol. The technic is said to be of value in studying chromosome fragmentation, chromatid coiling, centromeres, etc., in both somatic tissues and microspores.

A technic for differential staining of nucleoli and chromosomes, C. S. Semmens and P. N. Bhaduri (*Stain Technol., 14 (1939), No. 1, pp. 1–5, figs. 3*).—Material is fixed in Navashin or Levitsky fluid, the chromatin stained by De Tomasi's improved Feulgen technic, brought through the washing solutions down to distilled water, and transferred to a mordant (5 percent Na_2CO_3 in water), in which it is left for at least 1 hr. It is then washed well with water, stained for 10 min. in light green solution, differentiated in alcoholic Na_2CO_3 solution, treated with 95 percent and absolute alcohol and equal parts xylene and absolute alcohol, cleared in pure dry xylene, and mounted in neutral balsam. The light green behaves as a definite stain for nucleolar material.

Proceedings of local branches of the Society of American Bacteriologists (*Jour. Bact., 36 (1938), No. 6, pp. 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 666, 667, 668*).—Abstracts of the following papers presented are of botanical interest: Some Factors Affecting the Bacterial Population of Freshwater Lakes, by W. H. Stark, J. Stadler, and E. McCoy, and Growth Factors and Nitrogen Fixation by *Rhizobium trifolii*, by P. M. West and P. W. Wilson (both Univ. Wis.); Amino Acid Requirements of the Lactic Acid Bacteria, by A. A. Andersen, H. G. Wood, and C. H. Werkman (Iowa Expt. Sta.); A Technique for Staining and Counting Yeast Spores, by C. R. Arnold (Iowa State Col.); Staining of Bacterial Flagella, by E. Leifson; Dissimilation of Citric Acid by *Aerobacter indologenes*, by C. R. Brewer and C. H. Werkman (Iowa); Behavior of Added Hydrogen Acceptors on the Metabolism of *Aerobacter indologenes*, by M. N. Mickelson, H. Reynolds, and C. H. Werkman, and H_2/CO_2 Ratios of *Escherichia-Aerobacter*, by M. Silverman and C. H. Werkman (both Iowa State Col.); The Antagonistic Action of *Bacillus thermophilus, Bacillus subtilis, Escherichia coli-communis*, and *Alcaligenes fecalis* on *Sarcina lutea*, by O. Smith; Effect of Environment on Nitrogen Excretion by Leguminous Plants, by O. Wyss and P. W. Wilson, and Direct Determination of Free Nitrogen Uptake by Gasometric Methods, by C. Hurwitz and P. W. Wilson (both Univ. Wis.); Comparative Results Obtained by the Electrometric and Colorimetric Methods of Determining Bacterial Fermentation, by G. M. Savage (Univ. Minn.); A Preliminary Report on the Numbers and Distribution of Microorganisms in Beach Sands, by N. E. Rodgers and N. O. Sjolander, A Kinetic Method for the Study of Bacterial Dehydrogenases, by R. K. Tam and P. W. Wilson, Chromosome Numbers in Root Nodules and Root Tips of Certain Leguminosae, by L. Wipf, and The Destination of Nitrogen Fixed Within Leguminous Nodules, by G. Bond (all Univ. Wis.); Specificity Studies in the So-called "E" Group of Leguminous Plants, by J. C. Burton and L. W. Erdman; A Graphic Differentiation Between Secreted and Endo-Enzymes in Cultures, by O. Rahn, A. D. Console, and R. E. Deuel (Cornell Univ.); The Microflora of Flue-Cured Tobacco, by R. G. Harris, D. E. Haley, and J. J. Reid (Pa. State Col.); and A Distribution Study of *Chromobacterium lividum*, by J. W. Rice.

Growing fungi in cellophane, A. Dusseau (*Science, 88 (1938), No. 2287, p. 412*).—*Aspergillus, Fusarium*, and *Verticillium* were grown successfully in test tubes on rolls of cellophane or filter paper the bottoms of which were immersed in a few cubic centimeters of Knop's solution. The transparency of the cellophane was an advantage, and its apparent partial hydrolysis during sterilization improved the solution as a nutrient for the fungi.

Accessory growth factors for bacteria and related microorganisms, S. A. Koser and F. Saunders (*Bact. Rev., 2 (1938), No. 2, pp. 99–160*).—This analytical review (with 187 literature references) considers the various bacterial groups, yeasts, molds and higher fungi, miscellaneous studies (including protozoa), inorganic salts and growth-promoting effects, growth-promoting effects and removal of inhibiting agencies, such effects resulting from changes in physical properties of the medium, definite compounds with growth-promoting activity, synthesis of accessory growth factors and mutual influences, and the function of accessory growth factors. It is deemed significant that recent work has tended to indicate the close relationship between the nutrition and metabolism of micro-organisms and the higher forms of plant and animal life.

Mechanism of symbiotic nitrogen fixation.—III, Hydrogen as a specific inhibitor, P. W. WILSON and W. W. UMBREIT. (Univ. Wis.). (*Arch. Mikrobiol., 8 (1937), No. 4, pp. 440–457, figs. 2*).—In continuation of this series (E. S. R., 78, p. 608), with commercial electrolytic H replacing N in an atmosphere supplied to red clover, the total N fixed is said to be a linear function of the pN_2 (or pH_2) in the atmosphere. If the N is not replaced or is replaced by He or A, the total N fixed is independent of the pN_2 until the latter is lowered to ±0.1 atmosphere. These results suggest that H may be a specific inhibitor for this process, and the tests reported below support this theory.

The total amount of N fixed by inoculated red clover is shown to be negatively associated with the pH_2 of the atmosphere furnished, and statistically significant differences existed in the N content of inoculated plants grown under different partial H pressures. Although there was some indication that H in the atmosphere may inhibit the uptake of combined N slightly, such evidence could not be confirmed by statistical analysis of the data. In five tests the regression coefficient between assimilation of combined N and pH_2 of the atmosphere did not differ significantly from 0. Moreover, a combination of these tests resulted in no indication of the existence of a significant regression between the pH_2 in the atmosphere and assimilation of combined N. Analysis of variance in the amount of combined N assimilated by plants grown in atmospheres of different pH_2 indicated no significant differences in the N content of such plants and controls grown in the air. The inhibiting effect appears to be due to H itself rather than to accompanying impurities, since use of extensive purification chains failed to remove any effective substance, and H prepared from a variety of sources gave practically identical results.

Mechanism of symbiotic nitrogen fixation.—IV, Specific inhibition by hydrogen, P. W. WILSON, W. W. UMBREIT, and S. B. LEE. (Univ. Wis.). (*Biochem. Jour., 32 (1938), No. 12, pp. 2084–2095, figs. 5*).—As additional evidence, the assimilation of both free and combined N by red clover under the experimental conditions was sufficiently close to logarithmic to allow calculation of the unimolecular constants of N assimilation, the *g* values. These constants were particularly useful in detecting stimulative or inhibitory effects of a substance on the rate of a given reaction. Values of *g* for assimilation of free N were significantly decreased by addition of H to the atmosphere, but those for assimilation of combined N were independent of the presence of H therein. That the inhibitory effect of H is not associated with any stage or rate of growth was indicated by transferring plants to an atmosphere containing H after growing in air for various periods. The action was shown to be reversible, since plants kept in the presence of H immediately increased their rate of N assimilation if transferred to air or if combined N was supplied.

Nitrogen nutrition and nicotine synthesis in tobacco, R. F. DAWSON (*Bot. Gaz., 100 (1938), No. 2, pp. 336–346, fig. 1*).—Under conditions unfavorable to optimum carbohydrate formation, ammonium nitrogen as compared with nitrate appeared to have definitely increased the relative nicotine content of the leaves in their earlier growth stages, but under the test conditions this influence was soon lost and the ammonium-cultured plants, though lower in dry weight and showing definite ammonium toxicity, subsequently possessed nicotine concentrations indistinguishable from those in the comparable nitrate-cultured plants. No essential difference was noted between the effects of "concentrated" and "dilute" ammonium nitrogen on plant growth and dry weight, but the nicotine content responded to the increased nitrogen supply of the concentrated solutions by assuming somewhat higher proportions in the leaves. With urea nitrogen plant growth was inferior to that with the ammonium solutions, and the influence of urea on nicotine percentage was equivalent to the influence of one-half of the same molecular concentration of ammonium salts. Regardless of the nitrogen form used, solution cultures induced a lower nicotine concentration in the leaves than did soil cultures, even though the dry weights of the leaves were similar. It is suggested that such an action may have been associated either with differences in moisture content and aeration of the culture medium, or with qualitative or quantitative differences in the salt composition of the culture solutions.

The effect of light on the accumulation of ascorbic acid in young cowpea plants, M. E. Reid. (U. S. D. A. et al.). (*Amer. Jour. Bot., 25 (1938), No. 9, pp. 701–711, figs. 7*).—Light was found to have a remarkable effect on ascorbic acid accumulation during germination and early growth stages. Plants 7 days old, grown in the light, contained more than four times as much and at 11 days about nine times as much ascorbic acid as corresponding seedlings grown in the dark. There was a rough parallelism between growth and ascorbic acid content of all organs in both light and darkness. Ascorbic acid formed in the leaves in tissues containing chloroplasts was apparently translocated in part to other organs, but a high concentration was maintained in the leaves. Light appeared essential also for the synthesis of a substance other than ascorbic acid which is concerned with expansion of the blade. The quantitative distribution of ascorbic acid in the stem was similar to that of chloroplasts in plants grown in the light. There was some evidence that a fairly direct conversion of glucose to ascorbic acid may occur. In view of the results obtained, fruits and vegetables grown under low light intensity would apparently tend to have less vitamin C than those developed under greater illumination.

Photoperiodic perception in Biloxi soy beans, H. A. Borthwick and M. W. Parker. (U. S. D. A.). (*Bot. Gaz., 100 (1938), No. 2, pp. 374–387, fig. 1*).—In whole plants subjected to 8-hr. photoperiods, flower-primordium initiation occurred if the light intensity during the photoperiod was above 100 foot-candles but not below. Given an 8-hr. photoperiod of natural light plus 8 hr. of Mazda light, initiation occurred if the intensity of supplemental light was below 0.5 foot-candle, but not above. The stimulus to initiation at the growing points arises in the leaves and moves to the growing plants. Flower primordia were initiated at growing points kept either in darkness or on photoperiods above the critical, provided the leaves were kept on short photoperiods. Photoperiods shorter than the critical, when applied directly to growing points, had no effect on flower bud initiation. Control of initiation is exercised only through applying photoperiods of proper length to the leaves. "Whether the responses secured in these experiments are due to a flower forming hormone or to other causes remains to be determined."

Photoperiodism in relation to hormones as factors in floral initiation and development, K. C. Hamner and J. Bonner (*Bot. Gaz., 100 (1938), No. 2, pp. 388–431, figs. 11*).—The simple method used for subjecting different parts of a plant simultaneously to different photoperiods is described. Floral initiation resulted in *Xanthium pennsylvanicum* plants under photoperiods of less than

15 hr. with accompanying dark periods of longer than 8 hr., while under continuous subjection to photoperiods longer than 16 hr. with accompanying dark periods of less than 8 hr. they remained vegetative. The initial effect of the photoperiodic stimulus is perceived by the leaves subjected to short photoperiod, but this stimulus to floral initiation may be transported from these leaves to other parts of the same plant maintained under long photoperiod and also across a diffusion contact from a plant under short photoperiod to one under long photoperiod. This stimulus may thus be attributed to something manufactured in leaves under short photoperiod.

The response of *Xanthium* to photoperiod is primarily a response to length of dark period rather than of photoperiod. Thus reactions resulting in the formation of floral initiation substances may occur during the dark period which are adversely affected by light and low temperature. Fully expanded leaves on receptor branches under long photoperiod may exert an inhibitory, and young expanding leaves a promotive, influence on floral initiation and flower development. The development of mature flowers and fruit from floral primordia was also promoted by something formed in parts of the plant exposed to short photoperiod and which may move across a diffusion contact. Whether this is identical with the floral initiation substance is as yet undetermined. A part of the plant under long photoperiod may be influenced by another part under short photoperiods in such a way that it may behave as though it had been photoperiodically induced by direct exposure to short photoperiod. Flowers and fruit continue to develop on such parts of a branch as have never themselves been under short photoperiods.

Evidence is presented that the floral initiation substance is not identical with certain vitamins (B_1, B_2, and B_6), ascorbic, nicotinic, pantothenic, or indoleacetic acids, theelin, theelol, or inositol.

Nitrogen and carbohydrate metabolism of kidney bean cuttings as affected by treatment with indoleacetic acid, N. W. STUART. (U. S. D. A.). (*Bot. Gaz., 100 (1938), No. 2, pp. 298–311, figs. 4*).—Cuttings of the seedlings were treated by immersing their bases in 0.01 percent indoleacetic acid for 4 hr. and then leaving in sand in a propagating frame for 120 hr. During this time, as compared to controls, the treatment induced a directional shift of large amounts of nitrogen and carbohydrates from the leaves and cotyledons to other parts of the cuttings, and principally to the treated hypocotyls. Accompanying this mobilization, the treated cuttings responded by a rapid swelling of the hypocotyls, profuse root production, and temporary suppression of top growth. The total dry weight of the treated cuttings at the end of the rooting period was slightly less than that of the controls. Responses were proportional to the time exposed and the concentration of the indoleacetic acid. The possible importance of this substance as a mobilizer of food materials in various other growth responses is suggested.

Histological responses of cabbage plants grown at different levels of nitrogen nutrition to indole(3)acetic acid, E. GOLDBERG (*Bot. Gaz., 100 (1938), No. 2, pp. 347–369, figs. 10*).—Under observation for several weeks, decapitated soil-grown plants responded grossly to a 3 percent indole-3-acetic acid-lanolin mixture by producing masses of callus and root primordia. All stem tissues responded to some extent, those most generally so being the phloem, rays, and pith. Cambium, cortex, endodermis, and xylem were moderately stimulated, while the epidermis and pericycle reacted weakly. Adventitious roots developed from ray and phloem tissues, and some internal roots were produced from pith cells adjacent to the primary xylem. Near the application surface confused mounds of callus tissue derived mainly from phloem and pith produced irregular groups of meristematic tissues in which large numbers of tracheids matured. About a third of the plants produced viable shoots (either directly from the top of the callus or laterally at about the level of adventitious root production), which were initiated by cell divisions either in the central or innermost cell layers of the cortex or in the rays, and they always established organic union with vascular tissues of the main stem.

Laterally treated stems produced sunken areas through which the root primordia later protruded, but no mounds of callus. No activity was noted in the pith, but all other tissues reacted proportionally the same though to a less extent than in decapitated plants.

The reaction was slower in minus- than in plus-nitrogen plants, a much smaller callus being produced through which the root primordia rarely protruded. The same tissues were involved in both cases, although to a lesser extent in the minus-nitrogen plants. The pith and cortex of the latter were less active, most divisions being confined to the rays, phloem, and endodermis. Though the most active tissues in the minus-nitrogen stems, these were still not nearly so reactive as those in the plus series. The small amount of callus produced was less confused and showed greater vascularization than in the plus series, and maturation of many cells, formerly parenchymatous, into fibers was characteristic. Since the entire vascular cylinder was very unequally activated in the minus series, far fewer root primordia were produced and these rarely grew out far enough to penetrate through the cortex.

Differential growth in plant tissues, K. V. Thimann and C. L. Schneider (*Amer. Jour. Bot., 25 (1938), No. 8, pp. 627–641, figs. 11*).—The entry of indole-3-acetic acid into plant tissues was shown to occur through cut or wounded surfaces as well as through the intact epidermis, the evidence indicating it to be more rapid through the former, though the final state reached is probably the same in both cases. On immersion in auxin solutions, slit *Avena* coleoptiles and *Taraxacum* flower stalks behaved like *Pisum* stems. The inward curvature of these slit organs is said to be due not to differences in rate of auxin entry but mainly to differences in responsiveness to it by the inner v. outer tissue layers. The behavior of benzofurane-3-acetic acid, producing increased outward curvatures in all but very high concentrations, is noted in support of this view, and further support is derived from the fact that other auxins, in concentrations too low to induce inward curvatures, also increase the outward curvature of such slit organs. Direct measurements on the elongation of isolated layers of tissue confirmed the idea that the inner and outer layers behave differently to auxin—the inner layers exhibiting most of their auxin response in very low and the outer ones in very high concentrations. The tissue differences in auxin response are deemed the main cause of the "tissue tensions" referred to by the older botanists.

The action of ethylene on plant growth, H. D. Michener (*Amer. Jour. Bot., 25 (1938), No. 9, pp. 711–720, figs. 2*).—Ethylene was found to decrease longitudinal growth in intact oat and pea seedlings. It did not influence the production or transport of auxin, but increased the sensitivity of the plants to it. The manner in which ethylene decreases elongation remains in doubt, but it is said not to be due to its direct effect on auxin or on the action of auxin on the plant, and also it is probably not due to a direct effect of ethylene on elongation. Ethylene produced stem enlargements in pea and oat seedlings closely resembling those induced by high concentrations of auxin. Their formation depended on the presence of roots. Auxin in high concentrations and ethylene appear to act in the same way in forming these stem enlargements, but ethylene failed to induce swelling formation unless auxin was present in low concentration.

The Phycomyces assay for thiamin (vitamin B_1): The method and its chemical specificity, J. Bonner and J. Erickson (*Amer. Jour. Bot., 25 (1938), No. 9, pp. 685–692*).—Published data indicating that *Phycomyces* can utilize as a growth factor mixtures of the pyrimidine and thiazole components of the vitamin as well as the vitamin per se were confirmed, and it was shown that such mixtures have quantitatively the same activity as the vitamin itself. The higher plants thus far investigated are also able to utilize such mixtures. To be active as a vitamin a substituted thiazole must possess a free nitrogen atom which may form a quarternary salt with the vitamin pyrimidine, and a hydroxyl group or one readily metabolizable to such. A substituted pyrimidine to be similarly active must possess a reactive substituted 5-methyl group capable of yielding quarternary salts with the thiazole nucleus, and a 6-amino group. "Vitamin analogs consisting of vitamin pyrimidine combined with thiazole analogs possess activities substantially identical to those obtained when the same thiazole analog is supplied by *Phycomyces* in a mixture with the vitamin pyrimidine. In vivo synthesis to the vitamin analog, if it occurs, does not limit the activity of these substances."

The relation of copper and zinc salts to leaf structure, H. S. Reed. (Univ. Calif.). (*Amer. Jour. Bot., 26 (1939), No. 1, pp. 29–33, figs. 3*).—In tomato plants copper deficiency was found to result in dwarfing, involution of leaflets, color change, and eventual necrosis starting in schizogenous cavities resulting from the separation and shrinkage of palisade cells. In zinc-deficient nutrient solutions the plants were dwarfed with curvature, chlorosis, and involution of leaf blades with severe early necrosis. Here the palisade cells were longer, spongy parenchyma cells more compact, and the plastids smaller and fewer than in normal plants and contained oil droplets. The cells of the spongy layer started to degenerate first, contained tannin, and showed an abundance of calcium oxalate crystals.

Phosphate retention by sand in relation to seedling culture, A. A. Dunlap. (Tex. Expt. Sta.). (*Amer. Jour. Bot., 26 (1939), No. 1, pp. 15–17*).—Sand previously used in sand cultures to which $Ca(H_2PO_4)_2$ had been added in excess showed retention of phosphate after the sand had later been thoroughly washed with water, through the normal growth of young tomato plants subsequently grown in the sand supplied only with KNO_3 as mineral nutrient. Tests showed that the phosphate-retaining capacity was highest in highly colored fine grades of natural sand. Washing with dilute HCl removed from the sand a large part of the retained P.

Effect of sodium sulfate on the phage-bacterium reaction, A. P. Krueger and W. L. Strietmann. (Univ. Calif.). (*Jour. Gen. Physiol., 22 (1938), No. 2, pp. 131–138, figs. 2*).—Bacteriophagy occurring in the presence of M/8 Na_2SO_4 is said to have the following characteristics: The lysis time is considerably prolonged, the bacteria take up less than the normal amount of phage, phage production occurs at one-third the customary rate, it takes four times as much phage to lyse a treated as a normal bacterium, and bacterial growth is not affected by Na_2SO_4. The lag phase and the lowered rate of phage production can be attributed to the effect on the cell surface. Less phage is taken up by the cells, and contact of phage with the precursor-producing mechanism is impeded.

Relation of sulphate to selenium absorption by plants, A. M. Hurd-Karrer. (U. S. D. A.). (*Amer. Jour. Bot., 25 (1938), No. 9, pp. 666–675, figs. 3*).—Analyses indicated that the absorption of the selenium of sodium selenate varies directly with the amount available to the plant and (within limits) inversely with the sulfate concentration. However, although in both nutrient solutions and soils the Se absorption was sometimes reduced by excess sulfate to one-tenth that in corresponding low-sulfate cultures, it was never entirely prevented. The amount that wheat plants can contain without visible injury depended on their sulfur content. Analyses indicated a proportionally greater absorption of S than of Se—e. g., a Se/S ratio of 1:4 in the nutrient solution produced a ratio near 1:9 in the plants. Such plants were chlorotic and contained ±1,300 p. p. m. of Se with absolute amounts available of 4–24 p. p. m. The effect of sulfate in reducing the Se content of the several crop plants analyzed was more pronounced with young green plants than with old ones. The antagonism is discussed in relation to the idea that Se can be utilized instead of S in the synthesis of organic compounds. This theory and the quantitative relations shown by the data have suggested a possible explanation of the effect of S as a mass effect of an element sufficiently similar to Se as to preclude selectivity.

Loss of selenium by various grains during storage, A. L. Moxon and M. Rhian. (S. Dak. State Col.). (*S. Dak. Acad. Sci. Proc., 18 (1938), pp. 20–22*).—The results with wheat, barley, and corn indicated no close relationship between age of sample and loss of selenium. Rather, the amount of loss seems to be related to the form of the selenium in the grain.

The movement of selenium from germinating seleniferous grains, O. E. Olson. (S. Dak. State Col.). (*S. Dak. Acad. Sci. Proc., 18 (1938), pp. 41–43*).—Preliminary experiments with wheat, corn, barley, and *Astragalus racemosus* appear to indicate that plants grown from seed containing selenium depend to some extent, at least, on the seed itself for part of their toxicity. The disdistribution of selenium varied with the kind of plant and to some extent with the stage of growth, and several other factors probably contribute to variations in its distribution.

Growing plants without soil, E. A. Helgeson (*North Dakota Sta. Bimo. Bul., 1 (1938), No. 2, pp. 10–14, figs. 2*).—This is a general discussion of sand and water culture technic with special reference to its commercial possibilities. Nutrient formulas are given, and brief notes are included on acidity and minor elements, the cost of the solutions, yields to be expected, and water culture work at the station.

Concerning the conductive capacity of the minor veins of foliage leaves, R. B. Wylie (*Amer. Jour. Bot., 25 (1938), No. 8, pp. 567–572, figs. 3*).—Wounding the leaves of a lilac (*Syringa vulgaris*) in various ways involving interruption of major veins and partial isolation of parts of the blade so that isthmus connections containing only minor veins were left, the few small remaining veins of the connecting strips sustained the distal areas for 6 weeks and exhibited a conductive capacity exceeding that required of them in the normal leaf. There was neither enlargement of veins after lesion nor regeneration of vascular tissue in the connecting strips. "In the evolution of the foliage leaf capacity for prompt cicatrization of wounds and the possession of a minor venation capable of conductive overload in any direction have been factors of value in dealing with the inevitable problems of traumatism."

Relative humidity variations affecting transpiration, H. F. Thut (*Amer. Jour. Bot., 25 (1938), No. 8, pp. 589–595, figs. 7*).—Using purple and yellow coleus, *Hibiscus*, cotton, *Lantana*, and *Solanum dulcamara*, small portions of the leaves were exposed to various atmospheres of known relative humidity by fastening over "humidity bottles" containing H_2SO_4 solutions of different concentrations or pellets of NaOH or KOH, the rest of the plant being exposed to the usual laboratory or greenhouse environment. Under these conditions the water loss from the leaves was an inverse, linear function of the relative humidity over the entire range from 100 percent to nearly zero. The rate of increase of water loss with changes in relative humidity may be expressed as a constant, differing for the several plants. These plants in the order named above had 11.7, 10.1, 11.6, 16.2, 13.2, and 17.6 increase in units of water loss for every 10 percent decrease in relative humidity. As the latter increased the transpiration decreased, until at high humidities the leaves absorbed water instead of losing it. The point where transpiration ceases due to the high relative humidity is suggested as the relative humidity of the intercellular spaces of the leaf.

A quantitative study of the subterranean members of three field grasses, H. J. DITTMER (*Amer. Jour. Bot., 25 (1938), No. 9, pp. 654–657*).—In a quantitative study of the roots and root hairs of oats, winter rye, and Kentucky bluegrass, based on sampling from fields under normal cultivation, sample volumes of soil 3 in. in diameter and 6 in. deep were removed by a cutting tube and counts and measurements were made of the included plant parts. Assuming an even distribution of roots and root hairs in the samples from upper soil levels, oats would expose a surface of 15 sq. in. per cubic inch of soil, rye 30, and bluegrass ±65 sq. in., and the numbers of root hairs would be ±150,000, 300,000 and 1,000,000, respectively. Practically, these measurements suggest that oats would be least efficient, winter rye intermediate, and Kentucky bluegrass far superior to either in soil-binding possibilities.

Modified storage organs in Helianthus tuberosus, P. W. ZIMMERMAN and A. E. HITCHCOCK (*Contrib. Boyce Thompson Inst., 10 (1938), No. 1, pp. 1–3, fig. 1*).—Normally, Jerusalem-artichoke tubers are formed in the fall on rhizomes arising from underground buds. In plants grown from cuttings with the buds removed from underground parts so that no rhizomes could arise, the basal part of the stem became fleshy and served as a storage organ. When buds above the fleshy part remained attached they grew when the storage tissue was planted the following spring.

On the behavior of plant fibers dispersed in cuprammonium hydroxide solution, J. COMPTON (*Contrib. Boyce Thompson Inst., 10 (1938), No. 1, pp. 57–70, figs. 3*).—Successive lowering of the cuprammonium viscosity of native cottonseed fibers by dilute acids or mild oxidizing agents was not accompanied by a change in optical activity of the resulting dispersions. It follows that the optical activity of plant fiber dispersions in cuprammonium solutions depends on the formation of a cellulose particle-copper complex. Quantitative examination of variously treated plant fibers dispersed in such solutions revealed the presence of approximately the theoretical number of cellulose particles (1.1×1.5μ). Further evidence that cellulose-copper compound formation precedes dispersion of cellulose in cuprammonium solution is presented. Visible cellulose particles (1.1×1.5μ) have now been observed in dispersions of plant fibers in cuprammonium solutions. It is suggested that the behavior of plant fibers when dispersed in such solutions is attributable to properties of the crystalline microscopic cellulose particle in conjunction with the intercrystalline fiber phase. There are 26 literature references.

Behavior of the cell membrane of the cotton fiber in cuprammonium hydroxide solution, W. K. FARR (*Contrib. Boyce Thompson Inst., 10 (1938), No. 1, pp. 71–112, figs. 16*).—The cellulose component of the cell membrane of the cotton fiber—in the form of diminutive cellulose particles—failed to dissolve in the standard solution of cuprammonium hydroxide to produce the viscosities commonly attributed to it, but was transformed into a swollen, viscous mass of cementing material in which the cellulose particles were dispersed. The separated cellulose particles from which the cementing material had been removed did not produce viscosities in cuprammonium hydroxide. One component of the cementing material—the pectic fraction extracted with ammonium oxalate—produced viscosities in the same solution to the point of a stiff gel. It thus appears clear that the viscosity-producing power of the cementing material, or of any one of its fractions, has been overlooked, as has been also the presence in the cuprammonium solution of the cellulose in the form of diminutive particles of uniform size and shape, still undissolved, and merely in a state of dispersion. The bibliography contains 35 references.

Some observations upon the dispersion, electrokinetic, and coagulation behavior of cotton fibers in cuprammonium hydroxide solution, W. A. Sisson (*Contrib. Boyce Thompson Inst., 10 (1938), No. 1, pp. 113–126, figs. 4*).—Treated with electrolytically prepared cuprammonium hydroxide solution, cotton fibers swelled and were disintegrated into small particles which dispersed in the solution, exhibited Brownian movement, and possessed a negative charge. On removal of the cuprammonium cations by electrolysis the particles were coagulated to form a flocculent deposit. Microscopic examination indicated the deposit to consist of uniform-sized cellulose particles giving a mercerized X-ray diagram. The presence of particles in the deposited fiber material is attributed to a flocculation of colloidally dispersed crystalline particles rather than to the recrystallization of cellulose from a state of molecular dispersion in the cuprammonium solution. It is suggested that the peptization and change in crystalline structure of the cellulose particle may be associated with the formation of a swelling compound with this cuprammonium solution.

Sand-hill vegetation of northeastern Colorado, F. Ramaley (*Ecol. Monog., 9 (1939), No. 1, pp. 1–51, figs. 21*).—Besides recording the different plant communities, with their histories, this account includes quadrat and frequency studies, seasonal changes, climatic and edaphic data, and general floristics. Photographs, charts, tables, and a topographic map of a typical sand-hill area near Roggen, Colo., are included.

GENETICS

Nuclear size in plumular meristems of inbred and hybrid maize, E. A. Bindloss (*Amer. Jour. Bot., 25 (1938), No. 10, pp. 738–743, figs. 4*).—Plumular meristems and their nuclear volumes were studied in the embryos of three corn pedigrees, each consisting of two inbred lines and their hybrids which had been found to display heterosis. No correlation was noted between heavier hybrid embryos, as reported by Ashby (E. S. R., 63, p. 325), and larger plumular meristems in these embryos. Size of meristem in the hybrids appeared no greater than that in the larger parent, and there was no apparent correlation of greater meristematic mass with increased vigor in the hybrids. In general, nuclear size in the plumular meristem was relatively constant for each inbred line and each hybrid, suggesting that it is an inherited trait. In all pedigrees nuclear volumes of parents differed significantly. A positive correlation between nuclear size and heterosis in the hybrids was suggested in one pedigree but could not be demonstrated in the others.

Starch content in potatoes, F. J. Stevenson. (U. S. D. A.). (*Amer. Potato Jour., 15 (1938), No. 12, pp. 356, 357*).—Starch analyses of Maine-grown Green Mountain potatoes v. Parnassia, a so-called high starch producer in Europe, gave greater differences among tubers of each variety than among the two varieties. Parnassia is said to be inferior to Green Mountain as a variety, and the data on starch content are presented as illustrating the behavior of a character in the development of which environal conditions must be given as much attention as the genetic factors.

Studies on cytology and resistance to leaf rust of some interspecific and intergeneric hybrids of wheat, A. T. GUARD. (Purdue Univ.). (*Amer. Jour. Bot., 25 (1938), No. 7, pp. 478–480, figs. 4*).—In the crosses Chinese wheat × Vernal emmer, 7 lines had a haploid chromosome number of 14, while 17 had 21. All lines with the lower number were resistant to *Puccinia triticina* (physiologic race 65) in the seedling stage. Six of the lines with 21 chromosomes were susceptible and 11 were resistant. The wheat-rye hybrid studied was an amphidiploid. Meiosis showed only minor irregularities. There was 5–75 percent fertility, depending largely on environal conditions and particularly at flowering time. This line was very resistant. The 15 hybrids Chinese wheat × *Secale montanum* were sterile. Meiosis was very irregular, and no pollen was produced. These plants were very resistant.

The midget tomato: A new gene mutant, J. W. LESLEY. (Calif. Citrus Expt. Sta.). (*Jour. Heredity, 29 (1938), No. 10, pp. 393, 394, fig. 1*).—A record is presented of a new mutant tomato conspicuous for small size and dense cushionlike growth habit. It was found in 1935 as a single plant from a seed of Norton. No fruit could be obtained by selfing because of abnormal flowers and no or worthless pollen. A single fruit obtained by cross-pollination yielded nine seeds, of which three developed into plants showing no midget characters and all self-fertile. The F_2 contained both normal and midget plants. The proportion of midgets in the F_2 and F_3 was highly variable and always less than expected on the basis of a simple recessive, apparently because of low viability of the midget seed.

Cytogenic studies with the chrysanthemum [trans. title], N. SHIMOTOMAI (In *Bibliographia Genetica. 's Gravenhage (The Hague): Martinus Nijhoff, 1938, vol. 12, pp. 161–174, figs. 3*).—In summarizing studies by himself and others on the chromosomes in the chrysanthemum, the author states that the basic number is 9 but that Japanese forms are almost all polyploids. Garden forms varied greatly in the number of somatic chromosomes—from 53 to 67 in the large-flowered varieties.

The cytology of Cuscuta, S. O. FOGELBERG. (Univ. Wis.). (*Bul. Torrey Bot. Club, 65 (1938), No. 9, pp. 631–645, figs. 25*).—The chromosome numbers and behavior are reported on for some eight species of *Cuscuta*, and certain suggestions regarding species relationships are said to be furnished by the cytological facts available.

Crossing-over, K. MATHER (*Biol. Rev. Cambridge Phil. Soc., 13 (1938), No. 3, pp. 252–292, figs. 14*).—A theoretical discussion of crossing over, involving the coordination of genetical and cytological evidence as regards the time of crossing over, interference and the mechanism, and the expression of crossing over.

[Investigations in animal breeding in the Bureau of Animal Industry] (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1938, pp. 8, 9, 14–16, 21–23, 25, 26, 27, 28, 29–32, 34, 35*).—In continuing previous work (E. S. R., 79, p. 34), brief progress reports are given on the following investigations which have not been previously noted: Variations in the size of organs and skeletons of inbred guinea pigs; inheritance of intelligence, temperament, and behavior in dogs; variations in the progeny of beef bulls in the economy of feed utilization and dressing percentage; methods of conducting record-of-performance and progeny-performance tests with beef cattle; comparisons of rate of gain and body measurements of Milking Shorthorns and beef Shorthorns; cross-breeding studies with Guzerat, Africander, and Aberdeen Angus cattle and inheritance of contrasting characteristics; results of inbreeding Rambouillets; the development of the Targhee breed; crossing Hampshire and Suffolk rams with Rambouillet and Corriedale ewes; the reproductive capacity of different rams; further studies of the transportation of ram semen (E. S. R., 79, p. 35) collected by the electrical ejaculation method (coop. Idaho Expt. Sta.); statistical studies of the relationship of type, time of birth, size, and sex of lambs to survival, growth, and selection; improvement of karakul fur by cross-breeding; the development of Southdale sheep from Southdown × Corriedale crosses; the improvement of sheep suitable for northern Florida conditions; seasonal breeding of goats; inheritance of hermaphroditism in goats; comparison of the pork-producing efficiency of different breeds and types of swine in progeny-performance tests (coop. Ga. Coastal Plain Sta.); studies of the physiology of blood formation in swine; the effects of different systems of breeding on development and inheritance of various characters in swine (coop. Iowa, Minn., Mo., Nebr., and Okla. Stas.); improvement in various types and breeds of horses; studies on the physiology of reproduction, artificial insemination, and chemical tests for pregnancy in mares, stallions, and jacks (coop. Mo., Mont., Ga., Miss., and Tenn. Stas.); production from pregnant-mare serum of concentrated gonadotropic hormone; improvement of egg weight and thick albumen in Single Comb White Leghorns by selection; methods of sex determination of turkeys at hatching; and breeding white turkeys for small type.

[Studies in animal genetics by the Kansas Station], D. C. Warren, H. L. Ibsen, R. K. Nabours, and F. M. Stebbins (*Kansas Sta. Bien. Rpt. 1937–38, pp. 97–99*).—These studies include data on the influence of hybridization on vigor in poultry, chromosome mapping of the genes of the fowl, and inheritance in guinea pigs and the grouse locust.

Studies on spotting patterns.—IV, Pattern variation and its developmental significance, D. R. Charles (*Genetics, 23 (1938), No. 6, pp. 523–547, figs. 7*).—Continuing this series (E. S. R., 77, p. 609), studies were made of the proportion of animals in three spotted inbred strains of mice having 4, 20, and 35 percent white fur and in three crossbred strains between them which had pigmented fur on 508 small skin areas. Contours were constructed showing the distribution of the spotting according to genotype for four pairs of spotting genes—*S*, *K*, *E*, and *F* and their allels. Those carrying *S* were found to show systematic differences in the distribution of the pigment from those carrying *s*. Likewise, a difference in the primary effects between the *K*, *E*, and *F* genes and their allels and the *S* gene and its allel seemed evident. The concentration above the threshold level of a hypothetical substance at a certain point in the skin seemed necessary for pigment formation at that point. However, the necessary concentration probably varies from point to point over the body surface and in individuals of different genotypes. Tyrosinase could be determined in extracts of skin forming pigmented hairs but not in other skin.

Homologous and analogous morphological mutations in rodents, C. V. Green (*Biol. Rev. Cambridge Phil. Soc., 13 (1938), No. 3, pp. 293–306*).—Comparison is made between the mutations described for the mouse, rat, guinea pig, and rabbit. Instances of gene homology seem few. The dearth of sex-linked genes in rodents is striking.

The development of two tailless mutants in the house mouse, S. Gluecksohn-Schoenheimer (*Genetics, 23 (1938), No. 6, pp. 573–584, pls. 2*).—The embryological development of tailless mice of the genotypes *T*, t^0, and t^1, described by Dunn (E. S. R., 78, p. 610), is outlined. The tail develops normally to the eleventh day after gestation, after which a constriction separates the tail from the trunk. The tail is largely resorbed by the fourteenth day.

Experimentally induced mutations in chickens through X-rays [trans. title], I. M. **Krajevij** (**Kraevoĭ**, **Krayevoy**) (*Akad. Nauk U. R. S. R., Inst. Zool. i Biol., Zbir. Prac. Genet. (Acad. Sci. Ukrain. S. S. R., Inst. Zool. and Biol., Mem. Genet.), No. 2 (1938), pp. 109–160, figs. 11; Russ., Eng. abs., pp. 153–160*).—Irradiation with X-rays of sperm used in artificial insemination of hens reduced the percentage of fertile eggs produced from 54.2 to 30.9 percent; increased the production of various forms of head, tail, and leg abnormalities, monsters, and lethals; lengthened the incubation period slightly; and increased the weight of the chicks hatched alive. Females were more subject than males to the occurrence of both lethal and viable monstrosities.

The influence of inbred sires top-crossed on White Leghorn fowl, N. F. **Waters**. (Iowa Expt. Sta.) (*Poultry Sci., 17 (1938), No. 6, pp. 490–497, figs. 8*).—Studies over a 5-yr. period showed that sires from certain inbred families (E. S. R., 75, p. 763) were better than others for improving fertility and hatchability of the eggs and viability of the chicks produced in crosses with random-bred ♀♀. In general, top crosses of inbred ♂♂ on random-bred ♀♀ gave better results than were obtained with random-bred or inbred Leghorns. The method offers promise for breeding for improved fertility and viability.

A single chromosome explanation of Roberts and Quisenberry's Brahma × Barred Rock mosaic, S. S. **Munro** (*Jour. Heredity, 29 (1938), No. 10, pp. 389–391, fig. 1*).—The Brahma-Plymouth Rock mosaic of Roberts and Quisenberry (E. S. R., 75, p. 764) is explained on the assumption of linkage between the feathered-leg and extension genes and the failure of the Brahma chromosome carrying these genes to separate at the first chromatid division. Then the presence of two *e* genes would dominate *E* and cause lack of pigment, and the resulting feathers would resemble the light Brahma on one side. Thus, nondisjunction is considered to affect genic balance and the result obtained in this case.

The role of heredity versus environment in limb bud transplants between different breeds of fowl, H. L. **Eastlick**. (Univ. Mo.). (*Science, 89 (1939), No. 2297, pp. 17, 18*).—The characteristics of the donor tissue in reciprocal grafts between White Leghorn and Brown Leghorn embryos were variable, i. e., like the donor, like the host, or showing characteristics of both donor and host. Evidently, the degree of attachment determines whether an enzyme from the host reaches the graft and suppresses the color of the donor and stimulates complete or partial expression of the plumage and pigment of the host.

Does selective breeding pay? V. S. **Asmundson**. (Univ. Calif.). (*Calif. Turkey News, 1938, Aug., pp. 33, 35, 36, fig. 1*).—A discussion of possibilities for the improvement of market quality, livability, and egg production in turkeys by breeding.

Determination of hair structure.—I, The production of waved hair from genetically non-waved cells, S. C. **Reed** (*Jour. Expt. Zool., 79 (1938), No. 3, pp. 347–354, figs. 2*).—Following methods employed in preceding reports, grafts of waved hair tissue on nonwaved hosts and vice versa were both found to produce some wavy hair. In the first case, the genetically nonwaved cells invaded tissue organized for waved, but produced wavy hair. In the latter case, waved host cells invaded the nonwaved graft and also produced waved hairs. It is suggested that this influence of the waved cells in inhibiting growth and increasing the constrictions in nonwaved hairs is chemical in nature.

Determination of hair pigments, II, III, S. C. **Reed** (*Jour. Expt. Zool., 79 (1938), No. 3, pp. 331–346, fig. 1*).—Following methods employed in the first study of this series by S. C. Reed and G. Sander,[1] two studies are reported.

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[1] Growth, 1 (1937), No. 3, pp. 194–200, pl. 1.

II. *Transplantation results in mice, rats, and guinea pigs.*—Forty autotransplants and syngenesiotransplants of skin were made to newborn rats and mice. In all cases, the previously determined pigmentation and length of hair in the region from which the graft was made were maintained. However, the pigment of the ear and foot of black guinea pigs was found on histological examination to be able to migrate from the superficial layers for a limited distance in any direction.

III. *Proof that expression of the black-and-tan gene is dependent upon tissue organization.*—Study of the unexpected appearance in black-and-tan (a^ta^t) heterozygous for blue dilution and albinism, of black dorsal hair among albino hairs in a graft surrounded by tan host hair, and the appearance of tan hairs in a graft of ventral albino skin on the back of a black host, led to the conclusion that the infiltration of host cells into the graft produced hair characteristic of the skin grafted from another region. For example, "cells migrating from dorsal tissue which is potentially black into grafts of ventral tissue will produce tan hairs; conversely, cells migrating from ventral tissue (potentially tan) into a graft of dorsal tissue will produce black hairs." Substances necessary for pigment production are not diffusible from cell to cell, as postulated by Wright (E. S. R., 61, p. 218).

Genetic and endocrine studies on a transplantable carcinoma of the ovary, L. C. Strong, R. T. Hill, C. A. Pfeiffer, and W. U. Gardner (*Genetics, 23 (1938), No. 6, pp. 585–595, figs. 8*).—Tissue from an ovarian carcinoma grew in all the ♂ mice and in 8 of 168 ♀♀ of the CBA inbred strain[2] inoculated. In F_1s from the cross of this strain with the A strain, all of the ♂♂ and approximately 20 percent of the ♀♀ grew tumors. Reciprocal crosses gave similar results. Among the F_2s, 6.5 percent of the ♀♀ and 29.4 percent of the ♂♂ grew the tumors, from which it was estimated that approximately four pairs of Mendelian factors were involved, but some physiological mechanism inhibits tumor growth in the ♀. Tumors grew in only 14 of 31 castrated ♂ mice but grew more rapidly and better in ♀♀ after ovariectomy than in normal ♀♀. Pregnant-mare serum stimulated tumor growth in ♀♀; follicle-stimulating hormone growth in ♂♂; and oestrogen inhibited growth in both sexes. Following castration, the hormones had no effect on rate of tumor growth.

[Studies on the physiology of reproduction and hibernation in animals], R. F. Cox, L. F. Payne, E. H. Herrick, and D. C. Warren (*Kansas Sta. Bien. Rpt. 1937–38, pp. 77, 93, 110, 111*).—Results are noted of studies of the inoculation of gonadotropic hormones in Dorset ewes, the effect of dubbing on sex hormones, the relation of the adrenal glands of chickens to their gonads, the relation of pituitary glands to reproduction in chickens, the effect of hibernation on the blood of ground squirrels, the effect of male hormones upon the developing ovaries in chickens, and the relation of male hormones to the development of the femoral pores or color markings of collared lizards.

The sites of formation of estrogenic substances in the animal body, G. W. Corner (*Physiol. Rev, 18 (1938), No. 2, pp. 154–172, figs. 2*).—A review of the literature led to the conclusion that the oestrogenic hormone found in the ovary, blood, and urine of nonpregnant animals was most likely produced in the theca interna of follicles of all sizes. The oestrogenic hormone found in the placenta, blood, and urine of pregnant females of several species, including especially the human, seems from cases of double ovariectomy to be produced from an extraovarian source, which is evidently the placenta.

Comparative effects of light stimulation and administration of gonadotropic hormones on female sparrows, G. M. Riley and E. Witschi (*Endo-*

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[2] Brit. Jour. Expt. Path., 17 (1936), No. 1, pp. 60–63, figs. 3.

crinology, 23 (1938), No. 5, pp. 618–624, figs. 2).—Lengthened daily light periods induced only a moderate degree of ovarian development in sparrows. Female sparrows were partially refractory to injections of gonadotropic substances in September and October but less so later in the winter and not at all after February.

Failure of the anterior lobe of the pituitary to produce hormones in tissue culture, W. C. Cutting and M. R. Lewis (*Arch. Expt. Zellforsch., 21 (1938), No. 4, pp. 523, 524*).—As only minimal stimulation of the endocrines was induced in immature, virgin guinea pigs as a result of injection of the nutrient medium from anterior lobe tissue cultures from 10 to 20 days old, and then only after autolysis of the tissue, it was concluded that thyrotropic, adrenotropic, and gonadotropic hormones were not produced in tissue culture.

The effect of androgenic substances on the growth of the teat and mammary gland in the immature male guinea-pig, A. C. Bottomley and S. J. Folley (*Roy. Soc. [London], Proc., Ser. B, 126 (1938), No. 843, pp. 224–241, pl. 1, figs. 12*).—In studies at the National Institute for Research in Dairying, Reading, England, the growth of the teats in the normal male guinea pig was found to keep pace with general body growth, but there was no teat growth in the castrated animal. The injection of unsaturated androgens except Δ^4-androstenedione induced teat growth at an accelerated rate. However, the saturated androgens were inactive. Chemical differences between the active and inactive androgens in promoting teat growth are discussed.

The lactogen content of the pituitary gland of the lactating rat, R. P. Reece, I. L. Hathaway, and H. P. Davis. (N. J. and Nebr. Expt. Stas.). (*Jour. Dairy Sci., 22 (1939), No. 1, pp. 1–5*).—Assays on pigeons of extracts of the pituitary glands of three groups of lactating rats showed that the lactogen content was highest in the group tested 51 hr. after parturition and fell off in the group which suckled their young for 15 days. The lactogen in the pituitary extract was still further reduced in ♀♀ which had suckled their young for 22 days. From the results "it is suggested that the lactogenic hormone plays no major role in determining the height of the lactation curve, but may be a factor in determining the rate of decline in milk production."

On a differential sensitivity of the somatic tissues to the male sex hormone in two Br. Leg. × R. I. hens, C. J. Bond (*Jour. Genet., 36 (1938), No. 3, pp. 367–371, fig. 1*).—Two Brown Leghorn × Rhode Island Red hens which exhibited comb and wattles of the ♂ type and sex indifference are described. Small encapsuled bodies were found in quiescent ovaries. The response of the head furnishings and of feather and other characteristics to the ♂ hormone is taken to indicate differential sensitivity of somatic tissues to hormone influence.

The influence of testis on sexual plumage in the domestic fowl, A. W. Greenwood and J. S. S. Blyth (*Jour. Genet., 36 (1938), No. 3, pp. 501–508, fig. 1*).—Based on the hypothesis that hen feathering in ♂♂ is dependent on the sensitivity of the epidermal tissue and the amount of hormone stimulus applied, hen feathering was induced in a Brown Leghorn ♂ by the introduction into the abdominal cavity at 10 weeks of age of testes from six other birds. Observations on two ♂♂ exhibiting some ♀ characteristics in their plumage gave support to the hypothesis that ♀ feathering in ♂♂ was attributed to the state of activity of the testes and the sensitivity of the epidermis to hormone stimulation.

Ambisexuality in the female starling, E. Witschi and R. A. Miller (*Jour. Expt. Zool., 79 (1938), No. 3, pp. 475–487, figs. 10*).—The color of the bill of starlings of both sexes turns yellow during the breeding season, but the bills of gonadectomized birds remain black. The administration of androgens caused the bills of castrated animals of both sexes to turn yellow, but oestrogens had no effect. This result, together with the effects on the internal secondary sex organs, is taken to indicate the production and release of androgens by the ovary, as well as the testis, during the breeding season.

Feather characterization as studied in host-graft combinations between chick embryos of different breeds, B. H. Willier and M. E. Rawles (*Natl. Acad. Sci. Proc., 24 (1938), No. 10, pp. 446–452, figs. 2*).—A further analysis[8] is reported of the role of host and donor in feather characterization in the graft area. Both skin ectoderm with some mesenchyme attached and pure limb bud mesoderm were used as implants. Down feather pigmentation in skin grafts usually followed that of the donor except in certain White Leghorn grafts in which no white feathers appeared in the graft area. When the juvenile feathers appeared, some showed donor color; the distal portion of others was the color of the donor, and the proximal portion was host colored. The form, rate of growth, and arrangement of feathers were similar to those of the host. Juvenile plumage was generally the color of the host, and adult plumage was completely so. Both the host and donor play a part in feather characterization in the graft area. The feather structure is the product of host feather germs, but the color is controlled by the grafted tissue. Different results with White Leghorn transplants occurred in that they produced white feathers on Minorcas, but with Barred Plymouth Rock and Rhode Island Red breeds the host feather color is expressed. The controlling factors are concluded to reside in the skin and are not blood borne.

The shape of the chick embryo growth curve, I. M. Lerner. (Univ. Calif.). (*Science, 89 (1939), No. 2297, pp. 16, 17*).—Although in different sets of data the log of weight of chick embryos plotted against the log of age after 7 days has given a satisfactory fit to a straight line, sharp accelerations in growth rate have appeared between 13 and 17 days of age. Acceleration of growth at earlier ages in embryos incubated at 105° F. and distortion of the straight line in embryos incubated at 95° were observed in data from Henderson and Brody (E. S. R., 58, p. 352). It appears that the deviations from the straight line which occur at around the fifteenth day of incubation, though small, are significant.

The position of turkey, chicken, pheasant, and partridge embryos that failed to hatch, V. S. Asmundson. (Univ. Calif.). (*Poultry Sci., 17 (1938), No. 6, pp. 478–489*).—Observations on the embryos that failed to hatch of over 5,000 turkeys, chickens, pheasants, and partridges from different sources showed that the positions of the embryos were essentially the same, and significant species differences in position did not exist. Embryos rarely pipped the shell when the head was to the left or between the thighs, regardless of the end of the egg in which the head was located. If the head was turned to the right, the shell was usually pipped. Turkey embryos were handicapped if the head was in the small end of the egg. Larger numbers were in this position when the eggs were incubated horizontally than when the large end was up. Turkey embryos change their position during the last 3 or 4 days of incubation. Hereditary factors seemed concerned with the position of the head to the left in chicken embryos.

Cytological studies on spermatogenesis in the house sparrow, Passer domesticus, G. M. Riley (*Cytologia, 9 (1938), No. 2–3, pp. 165–176, figs. 28*).—Progressive cytological changes in the testes of sparrows are described and associated with the changes in the size of the gonads occurring in the different seasons. The larger chromosomes were paired into 13 groups, but the smaller chromosomes varied from 28 to 34, making a total count of from 54 to 60. One large chromosome was unpaired in ♀ embryos.

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[8] Natl. Acad. Sci. Proc., 23 (1937), No. 10, pp. 542–546, figs. 2.

Artificial insemination of ewes with transported semen, E. M. Gildow and C. E. Terrill. (Idaho Expt. Sta. and U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 3, pp. 157–159*).—This is a further account of the study previously reported (E. S. R., 79, p. 35).

The biological method of diagnosing pregnancy in mares (*Maryland Sta. Rpt. 1938, p. 43*).—Employing serum from about 400 mares from 40 to 80 days after breeding, pregnancy was diagnosed with over 90 percent accuracy. The ♂ rats did not give as definite tests as ♀ animals.

FIELD CROPS

[Crops research of the U. S. Department of Agriculture, 1938]. (Partly coop. Minn. Expt. Sta.). (*U. S. Dept. Agr., Sec. Agr. Rpt., 1938, pp. 128, 129, 130*).—Brief reports are made on the production of satisfactory yields by Thatcher wheat (E. S. R., 75, p. 480) under severe rust conditions in 1937 and 1938; the revival and stabilization of the beet sugar industry in Western States by use of U. S. 12 and U. S. 33, curly top-resistant varieties; growth of the one-variety community plan of cotton production resulting in cotton of improved yield, quality, and value; obtaining good stands of grass by seeding in stubble of Sudan grass or sorghum; control of bindweed by cultivating at from 12- to 21-day intervals; and the relative effects of sod cover, continuous grain, and fallow on water content of the subsoil in the Great Plains.

[Field crops research in the Bureau of Plant Industry]. (Partly coop. State expt. stas.). (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1938, pp. 2, 3, 4–7, 8, 9, 10, 11, 15, 16, 19, 20, 20–22, 24*).—Progress and accomplishments are reported on briefly from breeding work with corn, wheat, oats, barley, rice, cotton, hemp, sugarcane, sugar beets, potatoes, sweetpotatoes for starch production, tobacco, soybeans, alfalfa, and grasses; discovery of cold-resistant and inversion-resistant sugarcanes; development of wheat varieties resistant to hessian fly and nonbolting sugar beets and varieties resistant to curly top and to leaf spot; studies of the influence of variety and growth conditions on spinning value, development of fibers and their deterioration by micro-organisms, association of plant alkaloids with resistance to root rot, and advantages of one-variety communities, all with cotton; production of abacá (manila hemp) in the American Tropics; fertilizer experiments with cotton and tobacco; cultural experiments with seed flax and perilla; reduction of injury to potatoes in transit by proper loading; germination tests of stored grain to indicate condition and of range grasses; effects of cropping on subsoil water under dry-farming conditions and relations between annual precipitation and spring wheat yields; response of foliage and root growth of grasses to temperature and in growth and blooming to temperature and day length; hydrocyanic acid content of plant parts in sorghum; merits of dry inoculation of legumes; tolerance of strawberry clover to salt concentration; variations in coumarin content of sweetclover; Korean lespedeza as a supplement to Kentucky bluegrass pasture; pasture management practices for the Coastal Plain and reestablishing and improving grass cover in the southern Great Plains; production of grass seed on irrigated land and of sugar beet seed; and control of bindweed.

[Field crops experiments in Arkansas], M. Nelson, C. K. McClelland, L. M. Humphrey, L. C. Kapp, E. L. Nielsen, B. P. Johnson, C. H. Wadleigh, V. H.

YOUNG, J. R. COOPER, and V. M. WATTS (*Arkansas Sta. Bul. 368 (1938), pp. 17–28, 32–34, 35–50, 78, figs. 4*).—Work with field crops (E. S. R., 79, p. 321) at the station and substations reviewed briefly comprised variety trials with cotton. corn, wheat, oats, rye, barley, rice, grain sorghum and sorgo, soybeans, cow peas, and peanuts; oil contents of soybean varieties; breeding work with corn, cotton, and oats; fertilizer trials with cotton (formulas and rates), rice, and alfalfa; winter hardiness, including refrigeration experiments, with oats; cultural including planting tests with corn, oats, and rice; residual effects of summer legumes and winter cover crops on subsequent yields of cotton, corn, potatoes, and sweetpotatoes; interplanting of legumes in corn and effects on yields of the succeeding crop of oats and cotton; rice yields following corn, cotton, and soybeans and response of these crops to irrigation; crop rotation and winter cover crops for rice; effects of manganese, iron, and other elements on rice, their availability to, and relation to sterility in nutrient solutions; cotton investigations, including histological and cytological studies, environmental and yield relationships, effects of alternating drought with adequate supply of water on length of lint, nutritional studies, influence of the level of nitrogen supply to the plant on oil, protein, and gossypol content of cottonseed, and measurement of fibers of varieties of cotton; and pasture studies including fertilization, trials of seeds mixtures, tests of meadow and pasture plants, and cytological studies of grass species.

[Agronomic research in Colorado]. (Partly coop. U. S. D. A.). (*Colorado Sta. Rpt. 1938, pp. 15–17, 19, 20, 28–30, 34, 35, 46–50*).—Investigations with field crops and related studies (E. S. R., 78, p. 619), reviewed in these pages, comprised potato research, including breeding work, tests of seedlings and varieties, effects of soil fertility and other environmental factors on yield, plant, and tuber characters, composition, and cooking quality, factors affecting chemical composition and cooking quality, effects of treating soil with chemicals on reduction of scab, effects of psyllids on seed stock, date of planting tests, and seed certification; range research on improvement of native range, artificial revegetation with native grasses, irrigation and management practices to maintain and improve native hay meadows and sagebrush lands, and range resource surveys; and weed control studies, including effects of cultivating on carbohydrate reserves and nitrogen contents of bindweed and whiteweed, control of bindweed by cultivation, burning, and by chlorates and other herbicides, and a comparison of methods for determining effectiveness of control treatments.

[Field crops research in Kansas, 1936–38], R. I. THROCKMORTON, F. E. DAVIDSON, C. R. PORTER, A. B. ERHART, R. S. BARNETT, L. E. MELCHERS, G. A. DEAN, E. ABMEYER, H. H. LAUDE, J. H. PARKER, C. O. SWANSON, J. W. ZAHNLEY, A. M. BRUNSON, R. W. JUGENHEIMER, C. O. GRANDFIELD, A. E. ALDOUS, K. L. ANDERSON, J. C. FRAZIER, E. C. MILLER, A. L. CLAPP, C. K. OTIS, F. C. FENTON, E. B. WORKING, R. J. CLARK, J. E. ANDERSON, A. L. HALLSTED, A. F. SWANSON, L. E. WENGER, F. L. TIMMONS, L. C. AICHER, F. A. WAGNER, A. E. LOWE, H. J. HAAS, J. B. KUSKA, E. H. COLES, and T. B. STINSON. (Partly coop. U. S. D. A.). (*Kansas Sta. Bien. Rpt. 1936–38, pp. 21, 22, 25, 47–49, 50–62, 63–67, 68, 122–125, 126, 127, 128, 129, 130, 131, fig. 1*).—Results are reported on briefly from agronomic and related studies (E. S. R., 78, p. 34) at the station and substations, including varietal tests with flax, winter and spring wheat, corn, popcorn, oats, barley, grain sorghum, sorgo, soybeans, cowpeas, alfalfa for yield, winter hardiness, and wilt resistance, sweetclover, and miscellaneous grasses and legumes and forage mixtures; breeding work with corn, wheat, oats, barley, grain sorghum, sorgo, alfalfa, and pasture grasses; inheritance studies of factors affecting quality of wheat, including dough-ball or wheat-meal-fermentation-time tests and protein determinations on nursery-grown varieties and hybrids; cultural (including planting) experiments with flax, alfalfa, sweetclover, potatoes, wheat, corn, barley, oats, grain sorghum, soybeans, blue grama, bromegrass, crested wheatgrass, and buffalo grass; fertilizer tests with wheat, alfalfa, corn, sorgo, potatoes, oats, and bluegrass; cold resistance studies with wheat, including the relation of soil nutrients to cold resistance; a study of heat and drought tolerance in corn; effects of a nurse crop on sweetclover; alfalfa investigations in relation to winter hardiness and bacterial wilt, including correlation of root reserve storage with other physiological processes, seed production, and varietal improvement and adaptation; the influence of the method of harvesting and baling alfalfa hay upon quality; palatability experiments with grain sorghums and sorgo as fodder feed; a physiological study of the hard winter wheat plant; factors influencing the quality of wheat during farm storage in different types of bins; other wheat investigations, including studies of chemical factors influencing quality of wheat and flour, varietal factors influencing milling and baking quality of wheat, and tempering factors affecting the quantity and quality of flour; pasture research, including management of livestock and effect of burning on bluestem pastures, eradication of undesirable plants, and effects of different clippings and of fertilizers on yield and succession of pasture vegetation; seed production studies with bluestem grasses; pasture tests with winter wheat and mixtures of cultivated grasses and comparison of the amount of pasture from Sudan grass and winter wheat planted on summer-fallowed land; and weed control studies, including methods of killing bindweed with chlorate, cultivation, smother crops, and other practices, physiological study of bindweed in relation to its control, including its nature and development, and modification by cultivation, seasonal variations in place and extent of reserve storage, and seed viability, and effects of bindweed on wheat and oats yields.

[Field crops research in Maryland] (*Maryland Sta. Rpt. 1938, pp. 21, 22, 23–25, 26, 28–30, 31, 80, 82, 83, 88, fig. 1*).—Progress and accomplishments are again reported briefly from agronomic investigations (E. S. R., 79, p. 322), including breeding work with corn, wheat, barley, Kentucky bluegrass, orchard grass, white clover, and potatoes; genetic studies with corn; variety tests with corn, wheat, potatoes, and soybeans; germination of potato seeds; shortening dormancy in potato varieties with chemicals; fertilizer trials with early and late potatoes and sweetpotatoes; cultural experiments with sweetpotatoes; feed production in a dairy rotation; effects of fertilizer on fertility and grass population of pastures; and the plant production value of different samples of red clover seed.

[Field crops studies in Michigan] (*Michigan Sta. [Bien.] Rpt. 1937–38, p. 22*).—Results are briefly noted of studies on salt as a fertilizer for sugar beets, variety tests with potatoes, and benefits from proper field stacking of beans.

[Field crops experiments in Montana], (Partly coop. U. S. D. A.). (*Montana Sta. Rpt. 1937, pp. 17–19, 32, 33, 42–44, 45, 46, 47, 48*).—Superior crops and production practices are described briefly from current and completed agronomic research (E. S. R., 78, p. 325), including variety tests with wheat, oats, barley, rye, alfalfa, and miscellaneous forage grasses and legumes; soil moisture and tillage investigations; crop-producing capacity of soils; crop rotations on dry land and under irrigation and variously fertilized; relation between climatic factors and crop yields; response of potatoes to phosphatic fertilizers; seed potato improvement; merits of crested wheatgrass for pasture and regrassing abandoned land; and weed control by tillage rotations.

[Field crops experiments in West Virginia, 1936–38] (*West Virginia Sta. Bul. 290 (1938), pp. 15–17, 18–20, 24*).—Agronomic and related research (E. S. R., 76, p. 781) carried on at the station and substations during the biennium ended June 30, 1938, by J. A. Rigney, C. R. Burnham, G. G. Pohlman, T. C. McIlvaine, W. H. Pierre, W. M. Broadfoot, and K. C. Westover and reported on briefly included breeding work with barley, corn, and tobacco, and with sweetclover for low coumarin content; variety tests with corn, oats, and barley; planting tests with barley; fertilizer experiments with potatoes; fertilizer and liming tests with several field crops in rotation and with pasture (E. S. R.. 80, p. 333); response of alfalfa to fertilizer, to different levels of soil reaction adjusted by liming, and to limestone in the subsoil; responses of corn to sweetclover as a green manure in wheat and of wheat and timothy to cyanamide in nonlegume rotations; grazing and clipping (E. S. R., 77, p. 777) pasture herbage; and relation of soil properties to botanical composition (E. S. R., 77, p. 776) of pastures.

Bibliography of field experiments, H. M. Steece, F. R. Immer, J. T. McClure, and H. M. Tysdal (*Jour. Amer. Soc. Agron., 28 (1936), No. 12, pp. 1028–1031; 29 (1937), No. 12, pp. 1042–1045; 30 (1938), No. 12, pp. 1054–1056*).—Additions to the bibliography on standardization of field experiments as revised and supplemented (E. S. R., 74, p. 476) include 208 titles of contributions on methodology and interpretation of results of field research.

Important plant species encountered on pastures and abandoned farm land in the central and southern Great Plains in 1935 and 1936, D. A. Savage and H. E. Runyon (*U. S. Dept. Agr., Bur. Plant Indus., pp.* [2]+*19*).—A total of 124 grasses and 448 forbs, sedges, and shrubs found during ecological surveys after prolonged severe droughts are listed in alphabetical orders of genera and species and of tribes and families. See also an earlier note (E. S. R., 77, p. 775).

An analysis of first-year pastures in relation to seeding mixtures and stand establishment, W. Whitman and H. C. Hanson (*North Dakota Sta. Bimo. Bul. 1 (1938), No. 2, pp. 14–18*).—Analysis of seeds mixtures and resulting stands on adjacent 10-acre plats showed that a mixture containing smooth bromegrass 4 lb. per acre, crested wheatgrass 3, slender wheatgrass 3, western wheatgrass 4, and 1 lb. each of timothy, reed canary grass, white sweetclover, and alfalfa, totaling 18 lb., produced an excellent stand by the end of the first growing season. A second mixture of smooth bromegrass 8 lb., crested wheatgrass 5, and white sweetclover 2 lb. resulted in a much poorer stand, the difference being attributed largely to omission of slender wheatgrass. Reed canary grass, timothy, and western wheatgrass made especially poor showings under conditions prevailing in 1938.

Problems in evaluating pastures in relation to other crops, H. L. Ahlgren, G. Bohstedt, and O. S. Aamodt. (Wis. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 12, pp. 1020–1029*).—This paper presents the problems associated with and calls attention to the need for evolving a technic which can be used in evaluating various types of pasture crops in relation to themselves and to other crops which are grown as feed for livestock.

Lawn grasses and their management, H. F. A. North, T. E. Odland, and J. A. DeFrance (*Rhode Island Sta. Bul. 264 (1938), pp. 36, figs. 3*).—Suggestions on choice of lawngrasses and seeds mixtures, fertilizers, liming, and seeding lawns, and control of lawn pests and diseases are made from the more recent results obtained in experiments with lawn and turf grasses (E. S. R., 61, p. 825; 72, p. 317).

Rhode Island Colonial bent and also Piper and Kernwood velvet bent, adapted grasses tolerating acid soil, low fertility, and close clipping, form good lawns if given proper attention. Kentucky bluegrass is indicated for combination with Rhode Island Colonial bent, being particularly desirable on sports areas on a nearly neutral and at least medium fertile soil. Fescues, especially Chewing and red fescue, survive on soils too dry for bent or bluegrass, tolerate acid soil or dense shade, and withstand closer clipping than bluegrass. Domestic or Italian ryegrass has value as a nurse grass in mixtures for steep slopes, athletic fields, and where a quick growth is desired to shade and protect other types and to help suppress weeds.

Soils changed gradually in reaction as the result of fertilizers applied. An acid-reacting fertilizer, ammonium sulfate, gradually increased soil acidity on one series over 30 yr., while sodium nitrate, a basic fertilizer, gradually made another group of plats decidedly alkaline. In the acid plats, weeds were controlled effectively by the fertilizer treatments, but the turf was less vigorous than on the less acid plats. Excess acidity resulted in a sod-bound condition in the turf. Alkaline plats became badly weed infested, although certain grasses made a very vigorous growth. Plats with an indicated reaction of from pH 5 to 6 produced the most satisfactory turf.

Ammonium sulfate, when mixed with an equal weight of limestone to prevent the soil from becoming more acid, surpassed sodium nitrate in maintaining desirable turf and reduced the amount of white clover. On Kentucky bluegrass, manure alone or a complete fertilizer was more effective in maintaining good turf than either sodium nitrate or ammonium sulfate used alone. Superphosphate in combination with lime was found to be an excellent preseeding fertilizer. Heavy applications of potassium stimulated white clover at the expense of the grass. Compost applied as a top dressing on old lawns resulted in improvement of their average quality. Fertilizer high in nitrogen, such as a 10–6–4, 8–6–6, or 8–6–4 formula, is recommended for general use on lawns.

Lead arsenate was very effective in controlling crabgrass and chickweed and earthworms and webworms in turf.

Growth and yield in wheat, oats, flax, and corn as related to environment, R. S. Dunham. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 11, pp. 895–908, figs. 3*).—The growth curves, yields, and other agronomic data of wheat, oats, flax, and corn grown 1934–37 at Crookston, Minn., are presented, with temperature and precipitation data and graphs of soil moisture in the crop plats. Positive and fairly consistent association existed between weight of straw and yield of grain in wheat, but was much less apparent in oats and flax. Weight per 1,000 kernels was associated rather directly with yield of oats grain, to a lesser extent in flax, and much less in wheat. Number of seeds per boll was associated directly with flaxseed yield, but number of kernels per spike and yield of wheat grain was not associated. In corn, association of yield of forage was not apparent with rainfall and not uniformly with height. Available soil moisture provided a single factor which represents a resultant of various elements of environment. In the hot dry year of 1936, growth continued in wheat after soil moisture at all depths sampled had been reduced below the wilting coefficient, and growth continued in oats, flax, and corn after soil moisture at one or two depths had been so reduced. Measurement of several individual plants presented important advantages over mass samples.

Production of root crops for forage in Michigan, B. R. Churchill (*Michigan Sta. Circ. 168 (1939), pp. 16, figs. 6*).—Practical information on growing rutabagas, mangels, turnips, and carrots for feed, based on research at the station and Upper Peninsula Substation, covers choice of crop, production costs, cultural methods and field practices, storage, and preparation for feed. The merits of Jerusalem-artichoke as a silage and root crop are indicated.

Approved practices include the choice of rutabagas for the cooler areas and mangels for southern Michigan, growing the root crop once in 3 or 4 yr. after spring grain or corn in a rotation, and planting on a well-prepared seedbed in rows 30 in. apart at acre rates of from 2 to 3 lb. of seed for rutabagas—in late May or early June in upper Michigan—turnips, or carrots, and from 8 to 10 lb. for mangels—about corn-planting time in southern Michigan. Organic matter should be supplied by plowing under a sod crop or from 8 to 10 loads of manure per acre. From 300 to 500 lb. per acre of 4–16–4 or 4–16–8 commercial fertilizer broadcast on heavy loam, silt loam, and clay loam, and 3–12–12 on lighter sand or sandy loams is advised. Root crops should be blocked and thinned as soon as a good stand is assured, and when attacked by insects, especially aphids, the plants should be dusted with derris dust or a freshly mixed 3-percent dust of nicotine and hydrated lime. Roots should be harvested before freezing weather and stored in a cool, well-ventilated bin at from 36° to 40° F. These crops should be chopped before feeding, and rutabagas or turnips fed to dairy cows after milking to prevent off-flavor in milk.

Comparison of the environment and certain physiological activities of alfalfa and prairie vegetation, M. T. Fredricksen. (Univ. Nebr.). (*Amer. Midland Nat., 20 (1938), No. 3, pp. 641–681, figs. 22*).—A comparison of the environment, growth, and water losses in upland prairie and in an adjacent alfalfa field was made at Lincoln, Nebr. (1935–36), following a season of extreme drought. Despite the below-average rainfall of 1935–36 the run-off was nearly 11 times as much in the alfalfa field as in the prairie, and the available soil moisture was greater at all depths in the latter. The alfalfa survival, after planting in the early fall of 1934, was only 37 percent as great in midsummer, 1937, as in July 1935, though the stand appeared normal for each season. The average day temperatures of the air were 60°–99° F., and were nearly identical in both locales, while soil temperatures at 3 in. averaged 59°–94°, and the prairie vegetation was more effective than alfalfa in protecting against soil temperature changes. The average variations between maximum and minimum day temperatures of the soil were 4° higher for alfalfa. The average maximum day humidities were 3 percent higher for the prairie.

The average day humidities were nearly the same in the two habitats, but the night humidities were 4.3 percent higher for the prairie. Wind movement 1 ft. above the soil averaged 0.4 mile per hour greater in the field the first season and 2 miles per hour the second, and evaporation at 4 in. above the soil was 15.5 cc per day greater in the alfalfa field. Evaporation from atmometers 20 in. above the soil was 54 percent greater in the prairie and 42 percent greater in the field than from those operated at 4 in. Light intensities at the soil surface in prairie and alfalfa were 22 and 37 percent, respectively, of full sunlight, while at 6 in. they were 42 and 68 percent.

A new type of phytometer containing native sod was devised for studying water usage by grasses, allowing for both transpiration and surface soil evaporation. The average daily loss per 1 sq. ft. of soil proved to be 0.89 lb. in prairie and 1.35 lb. in the field in 1935, and 1.15 and 2.17 lb., respectively in 1936. Water usage per gram of dry matter produced was 1,296 and 1,283 g in prairie and alfalfa, respectively, in 1935, but 2,684 and 2,498 g during the summer of great drought (1936). Based on yields from the phytometers, alfalfa produced 58 and 100 percent more dry matter per 1 sq. ft. of soil during the 2 yr. than did prairie. The yield per acre for alfalfa during 1935 was 3,840 lb., and for prairie 3,510 lb. Corresponding yields for the drought year were only 1,920 and 1,459 lb. The greater yields of alfalfa were at the expense of excess water (here furnished the phytometers) of both soil and subsoil, which were thoroughly dried.

"In the light of experimental evidence, 'the practice of growing alfalfa on uplands in regions of limited precipitation and thus for a time exceeding the normal possibilities of the environment in terms of crop production seems unwise. Losses in water content, soil structure, run-off, and erosion ensue, which do not occur under a cover of grassland, either natural or artificial."

The bibliography contains 34 references.

Varietal differences in barleys and malts.—III, Correlations between nitrogen and saccharifying activities, J. A. Anderson, H. R. Sallans, and C. A. Ayre (*Canad. Jour. Res., 16 (1938), No. 11, Sect. C, pp. 456–466, figs. 2*).—Further investigations (E. S. R. 80, p. 185) with 144 samples representing 12 varieties of barley, grown at 12 experiment stations in Canada, showed that fairly close intravarietal correlations exist between the total nitrogen of barley and the saccharifying activities of the barley and its malt. These correlations were closer than corresponding ones with nitrogen fractions. No intervarietal correlation existed between saccharifying activities and total nitrogen, alcohol-soluble nitrogen, or insoluble nitrogen but did seem to exist between saccharifying activities and the more soluble nitrogen fractions. Latent barley saccharifying activities correlated more closely with total nitrogen than with any nitrogen fraction studied. Multiple correlations between malt saccharifying activity and total nitrogen and 1,000-kernel weight of barley showed that the improvement resulting from introduction of 1,000-kernel weight as a second independent variable is very small.

A new clover for the black lands in the South, D. G. Sturkie. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 11, p 968*).—"Wild European clover", or Lappacea clover (*Trifolium lappaceum*), promises to become valuable on the heavy clay soils of the "Black Belt" of Alabama and other Southern States. This creeping annual with dense pubescence on leaves and stems, reaches a height of 18 in. on good soil, produces a large yield of hay, is excellent for pasture, and reseeds when pastured or cut for hay. The seed germinate in the fall, and the plant reaches a height of 4 or 5 in. in February, makes rapid spring growth, and dies in June. It has never been killed by cold in middle Alabama.

The relation between leaf tissue pigment concentration and yield in corn, E. S. Miller and I. J. Johnson. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 11, pp. 941–946*).—A very marked relationship was observed between total chlorophyll and total carotenoids in the parental inbred lines and in their yellow endosperm F_1 crosses. The percentage of total chlorophyll in the F_1 crosses exceeded the average of the two parents, indicating possible heterosis for the chlorophyll pigments. Variations in chlorophyll concentration in leaves evidently do not have an important effect on yield in corn. A highly significant positive correlation was obtained between the percentage of total chlorophyll and total carotenoids in corn leaf issue.

Comparison between the freezing and acetone methods for preserving corn leaf tissues for pigment analysis revealed, spectrophotometrically, that slightly the least amount of decomposition occurred in the frozen series.

Comparative effects of furrow, level, and ridge culture on corn production at Baton Rouge, Louisiana, H. B. Brown and H. C. Lovett (*Louisiana Sta. Bul. 302 (1938), pp. 15, figs. 5*).—Corn grown on ridges, a common practice in south Louisiana, invariably outyielded corn grown on level plats, 1929–36, and averaged 12.9 percent more grain per acre. Sudan grass produced 7.7 percent more hay on ridged plats in a 1-yr. test. In several years corn grown in furrows (1934–36) also had some advantages over level culture. Very few corn roots were found in the upper 2 in. of soil and few penetrated the subsoil. Heavy growth of roots occurred in the ridges but few elsewhere with ridged corn, while roots extended into the middles under level culture. In furrow plantings more roots were massed near the stalk than in level corn and spread more throughout the middle than in ridged corn, and more roots entered the subsoil. Soil in uncropped plats averaged for five spring sampling dates 21.9 percent moisture, 51.7 percent pore space, and 33.9 p. p. m. of nitrate nitrogen in the ridges, while respective figures for soil in level plats were 21.5, 47, and 30.8. Similar data were also recorded for soil growing corn under the three methods. Corn and Sudan grass plants on ridges were darker green and grew more rapidly early in the season. Ridge culture for corn, the authors conclude, requires less effort in seedbed preparation and cultivation and returns better yields than level culture.

Carbohydrates of the cotton plant under different seasonal conditions and fertilizer treatment, D. R. Ergle, L. E. Hessler, and J. E. Adams. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 11, pp. 951–959, figs. 2*).—Seasonal changes in carbohydrate concentrations were similar for cotton plants grown on Wilson fine sandy loam and Houston black clay soils in Texas. The level of carbohydrates was greater in plants from the Wilson soil, probably due to drought conditions, than those from the Houston. The monosaccharide, disaccharide, and polysaccharide contents of plants from the Wilson soil were affected by fertilizers, while only polysaccharides in plants from the Houston soil seemed to be influenced definitely. Correlation of fertilizer treatment and plant growth was noted for both soils. Whole plants did not reflect effects of fertilizer treatment as well as root and aerial segregates studied previously. See also other papers reporting results in this program, noted earlier (E. S. R., 76, p. 471; 78, p. 329; 79, p. 621).

Registration of varieties and strains of oats, VIII, T. R. Stanton. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 12, pp. 1030–1036*).—Improved varieties of oats approved for registration (E. S. R., 74, p. 481) and described with performance records included Fulton, an early red oats derived from Fulghum × Markton; Carleton, an early yellow oats from Sixty-Day × Markton; and Bannock, a midseason white variety from Markton × Victory oats.

New disease-resistant early oats from a Victoria-Richland cross, T. R. Stanton, H. C. Murphy, F. A. Coffman, L. C. Burnett, and H. B. Humphrey. (U. S. D. A., 11 expt. stas., et al.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 12, pp. 998–1009*).—Victoria oats, a variety introduced from Uruguay in 1927 and having high resistance to crown rust and the oats smuts, was crossed with many commercial varieties. Selections from Richland × Victoria (E. S. R., 71, p. 203), as indicated by tests in Iowa and other States, have, especially under Corn Belt conditions, very high yielding abilities, and high test weight in addition to high resistance to the smuts and rusts.

Effects of vernalization on certain varieties of oats, J. W. Taylor and F. A. Coffman. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 12, pp. 1010–1019, figs. 2*).—Vernalization (E. S. R., 71, p. 182) of two winter oats, three intermediate, and one spring variety, 1933-37, hastened the heading date from 2 to 10 days in varieties with a low temperature requirement and shortened the period from seeding to heading an average of 6 days. Spring oats showed no earlier heading, Iogold being retarded in certain years. Yields of Frazier, Nortex, and Fulghum (C. I. 2499) averaged higher from vernalized than from untreated seed. The greatest increase occurred in Nortex, which averaged over 20 percent higher. Lee and Fulghum (C. I. 708) and the spring Iogold showed lower yields after vernalization. The 4-yr. average yield from untreated Iogold was the same as the average of the other five oats after vernalization. Spring oats planted early outyielded all vernalized oats, and fall-sown oats yielded about 20 percent more grain than the highest yielding vernalized variety. The treatment greatly reduced the occurrence of oat smut.

Spacing Virginia type peanuts, R. L. Lovvorn and P. H. Kime (*North Carolina Sta. Agron. Inform. Circ. 115 (1939), pp. [1]+4*).—Virginia Bunch (5 yr.) and Jumbo Runner (3 yr.) peanuts made total yields proportional to number of plants per acre when spaced 1 plant in hills 4 in. apart and 1 or 2 plants in hills 8, 12, and 16 in. apart in tests near Rocky Mount, N. C. Number of plants per hill had little effect on yield, and the different spacings did not affect greatly the percentages of handpicks or large and medium-shelled nuts or total shelling percentage in either variety. Two plants every foot was the most economical spacing.

Relationships between some soil measurements and the incidence of the two common Poas, H. B. Hartwig. (Cornell Univ.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 10, pp. 847–861, figs. 2*).—In 19 New York pastures on Dunkirk silty clay loam, *P. pratensis* (Kentucky bluegrass) dominated the vegetation with numerous patches of *P. compressa* (Canadian bluegrass) interspersed, while in 20 day pastures on Ontario loam *P. compressa* dominated. *P. compressa* dominated in the provinces of lower hydrogen-ion concentration (or higher pH) and of higher replaceable calcium. Data for replaceable hydrogen agree generally with the pH figures. More replaceable magnesium and potassium, available phosphates, and total nitrogen occurred under *P. pratensis*. Mean approximate total exchange capacities were higher for *P. pratensis* in both provinces. A high degree of positive correlation existed between total nitrogen and approximate total exchange capacity except for the *P. compressa* soils taken in the *P. pratensis* area. Mean approximate metallic base saturation was higher for soils beneath *P. pratensis* than beneath those of *P. compressa* in the area where the latter is dominant. There was a high degree of positive correlation between pH and metallic base saturation.

The Sebago potato, a new variety resistant to late blight, F. J. Stevenson and C. F. Clark. (Coop. Maine Expt. Sta.). (*U. S. Dept. Agr. Circ. 503 (1938), pp. 7, figs. 2*).—Sebago, a new variety of potato selected from Chippewa × Katahdin for resistance to late blight, in repeated tests has proved moderately resistant to late blight and highly resistant to mild mosaic under field conditions. It is vigorously growing, produces comparatively high yields of tubers high in market and cooking quality, and seems to be adapted to Maine conditions and to certain localities in New York. Its lateness indicates that it probably will be better adapted to late-potato sections and especially in parts of these sections often subject to epidemics of late blight.

Time of irrigating potatoes as affecting stolon growth and tuber set and development, W. C. Edmundson. (Coop. Colo. Expt. Sta. et al.). (*U. S. Dept. Agr. Circ. 496 (1938), pp. 18, figs. 8*).—Effects of early and late applications of the initial irrigation on stolon growth and tuber set and development of Rural New Yorker No. 2 and Triumph potatoes were studied at Greeley, Colo., 1929–35. Plats irrigated early received water throughout the growing season when needed to maintain continuous vigorous growth and foliage color typical of the variety. Late-irrigated plats did not receive the first application until 2 or 3 weeks later or until the plants were dark green and checked in their growth. Early irrigation resulted in a slight lowering of soil temperatures during July and August. Early irrigations had slight effect on number of stolons produced per hill but caused much faster growth and development of stolons. Indications were that moisture and soil temperature have some effect on length of tuber-bearing stolons and on those not developing tubers. In years of high soil temperature, Triumph plants in late-irrigated plats developed long stolons with aerial stems. Plants receiving early irrigation produced an early set and more rapid tube development than those receiving the initial irrigation later. Early irrigation had little effect on total number of tubers per hill but producd more tubers weighing 85 g or more.

The "alkali test" as a quality indicator of milled rice, J. W. Jones. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 11, pp. 960–967, figs. 4*).—When milled kernels of rice varieties were immersed in a dilute solution (2.38 percent) of potassium hydroxide, the type of disintegration was consistent in all samples of certain rice varieties and inconsistent in others. There was evidence of association in cooking quality and type of kernel disintegration. Varieties of similar grain types in which the kernels disintegrate into clear and/or intermediate masses in general were believed of better cooking quality than those disintegrating consistently into opaque masses. The alkali test permits detection of certain common undesirable varietal mixtures of milled rice and may be of value in rice breeding to permit the discarding of varieties and selections of inferior quality after preliminary nursery tests.

The use of morphological characters as compared with fluorescence tests with ultra-violet light in classifying the ryegrasses (Lolium spp.) of western Oregon, H. H. Rampton. (Oreg. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 11, pp. 915–922, fig. 1*).—Nursery trials and fluorescence tests were conducted with many lots of ryegrass seeds obtained in western Oregon and imported stocks. The domestic ryegrass, commonly grown in western Oregon, is a mixture of types closely associated with the European Italian ryegrass type and a few that are perennial-like. "Oregon Wild" ryegrass contains many perennial-like plants. There was little evidence that an appreciable amount of perennial ryegrass currently exists in commercial domestic ryegrass. Fluorescence tests indicated that domestic ryegrass is approximately 5 percent perennial or perennial and nonfluorescent intermediate forms of ryegrass, but nursery behavior revealed less than 1 percent of perennial-like plants. Domestic ryegrass and Italian ryegrass of New Zealand and Ireland were similar in fluorescence reaction. Limitations of the fluorescence test are indicated.

Zonal distribution of nitrates and its effect on nodulation of soybeans, G. Z. Doolas. (Mo. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 11, pp. 909–914, figs. 2*).—Varying the nitrate concentration from 52 to 300 p. p. m. in two soil zones (Putnam silt loam) gave decreased numbers and weights of nodules on soybeans in zones receiving the nitrates. Such effects carried into the nitrate-free soil zone to decrease the weight of the nodules when the nitrate applications were larger. With application of the same concentration of nitrates in the inner zone and consequently less total nitrogen the effects were not transmitted so distinctly to the distal parts of the roots. The depressive effects were more pronounced on weight or development than on numbers of nodules. Decrease in total weight of nodules on the entire root system, as well as on the segments, was influenced more by the total amount than by the concentration of nitrate nitrogen applied.

Comparison of heights, yields, and leaf percentages of certain sweetclover varieties, W. Hermann (*Washington Sta. Bul. 365 (1938), pp. 25, figs. 4*).—Varieties of sweetclover tested 1930–37 ranged from June 5 to July 11 in average date of blooming, Albotrea being extra early; Alpha 1, Grundy County, and Zouave Yellow early; Alpha 3, Arctic, Madrid White, and Madrid Yellow average; Common White and Willamette White late; and Redfield Yellow extra late blooming. Madrid White grew significantly taller in the first year of development than Albotrea, Alpha 1, Alpha 3, and Grundy County, and surpassed these and Zouave Yellow in second-season development. Madrid White, Madrid Yellow, and Willamette White yielded more first-season hay than Albotrea, Alpha 1, Alpha 3, and Grundy County, and in the second season Madrid White and Willamette White were about equal in productiveness and yielded more hay than any other variety tested. First season leaf percentages averaged for Grundy County 60.3, Zouave Yellow 53.4, Alpha 3 53.3, Redfield Yellow 52, Alpha 1 51.6, Madrid White 49.3, Albotrea 48.1, Arctic 47.7, Common White 47, Willamette White 44.2, and Madrid Yellow 42.5 percent. In the second season the leaders in leaf percentage were Albotrea 41.8, Zouave Yellow 35.1, Madrid Yellow 34, Alpha 1 31.9, and Grundy County 29.9 percent. Madrid White, Madrid Yellow, and Willamette White are recommended on yield and leaf percentages for production of first- or second-year hay and Alpha 1 for cover cropping. Arctic and Common White are suggested if seed of the first three is not available.

A comparative study of suitability for drying purposes in forty varieties of the sweetpotato, J. S. CALDWELL, H. H. MOON, and C. W. CULPEPPER (*U. S. Dept. Agr. Circ. 499 (1938), pp. 52*).—About 70 varieties and strains of sweetpotatoes were studied to determine their merits as material for dried products. Varieties combining satisfactory appearance and quality of dried product with suitable productiveness and disease resistance were ranked in groups, the members of which were deemed as of about equal merit in quality. Nancy Hall, Myers Early, Mullihan, and Mameyita were somewhat superior in quality to all others, and were followed rather closely by a group comprising Big Stem Jersey, Yellow Jersey, Porto Rico, Yellow Strasburg, and Red Bermuda. The third group, graded good in quality, included Red Jersey, Early Red Carolina, Vineland Bush, Gold Skin, Creola, Dooley, Key West "yam," Pumpkin "yam," and Vineless Pumpkin "yam." A fourth group which made quite acceptable products graded fair in quality contained Florida, Norton, Red Brazil, Triumph, and Southern Queen and its strains, Ballinger Pride and Miles "yam." The remainder of the varieties were rejected as unpromising because of inherently poor quality, low yields, lack of resistance to common diseases, or other undesirable characters. Among the groups and subgroups of American sweetpotatoes, the Jersey and Pumpkin groups and the Bermuda section of the Spanish group were rather consistently high in quality, while the Belmont and Southern Queen groups were consistently low or mediocre in quality. Other varietal groups, insofar as studied, appeared to be rather less uniform in quality of their members.

The methods developed for drying the sweetpotato in slices or strips which may later be prepared as baked or candied, creamed, sautéed, or French fried sweetpotato, or as pie filler consist in peeling by abrasive machine or immersion in hot lye solution, washing and trimming, slicing or cutting into longitudinal strips, immersing in dilute citric acid solution to prevent darkening, spreading on trays, steaming until cooked, and drying at from 130° to 165° F. to a residual moisture content of from 12 to 15 percent. Material so prepared was not hygroscopic and could be stored for long periods without deterioration in appearance or table quality if protected from weevils and beetles, to which it is highly attractive. It is not attacked by the ordinary dried-fruit insects. Sweetpotatoes may be dried just after digging or after curing and storage. Products from cured and uncured stock of a given variety differ somewhat in appearance, flavor, and behavior in cooking, but will be of like quality.

Spring and winter wheat varieties under irrigation, E. J. WELLHAUSEN (*Montana Sta. Bul. 365 (1938), pp. 35, figs. 10*).—Yields and other agronomic data and milling and baking values are reported for varieties of hard red and white spring and hard red and soft red winter wheats tested under irrigation, 1922–37, supplementing a report for 1922–28 (E. S. R., 64, p. 436).

Although Reliance, Comet, Thatcher, and Supreme hard red spring wheats proved superior to Marquis in yield, about equal or slightly earlier in maturity, and (except Supreme) about equal to Marquis in resistance to bunt, it seemed debatable whether they should be recommended over Marquis under irrigated conditions. Thatcher had several good qualities which might recommend it especially where rust may be a controlling factor in wheat production. Onas white spring wheat outyielded Federation, the generally recommended variety, by an average of 6.8 bu. and Marquis by 17 bu. per acre, and it would be indicated if wheat were grown for feed. However, limited demands for white wheat for milling would make the profitable replacement of Marquis or other hard red spring wheat depend on differences in income per acre. Yogo and Cheyenne winter wheats outyielded Montana 36 and compared favorably in other respects except their slightly lower protein content.

Hard red winter wheat varieties, K. S. QUISENBERRY and J. A. CLARK (*U. S. Dept. Agr., Farmers' Bul. 1806 (1938), pp. II+18, figs. 11*).—This revision of Farmers' Bulletin 1585 (E. S. R., 62, p. 37) describes distinguishing characteristics and indicates the distribution of the 34 varieties of hard red winter wheat grown commercially in the United States.

Registration of improved wheat varieties, XII, J. A. CLARK. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 12, pp. 1037–1042*).—Wheat varieties approved for registration included Nebred, a winter wheat, selected out of Turkey for resistance to bunt; Pilot, a hard red spring variety derived from Hope × Ceres; and Thorne soft red winter wheat (E. S. R., 80, p. 191). Brief descriptions and records of performance are given.

Changes in weedy plant cover on cleared sagebrush land and their probable causes, R. L. PIEMEISEL (*U. S. Dept. Agr., Tech. Bul. 654 (1938), pp. 44, figs. 8*).—The nature and rate of changes in weedy plant cover occurring on abandoned fields (E. S. R., 68, p. 42) in southern Idaho and species involved were determined, 1928–35, for a number of fields and plats.

Successive plant covers were Russian-thistle; then mustards, either flixweed or tumblemustard; and next, downy chess (*Bromus tectorum*). Flixweed supplanted Russian-thistle the third season under favorable conditions, and downy chess supplanted flixweed in the fifth. Russian-thistle formed the first cover because of efficient seed distribution but did not continue to hold the ground. Downy chess and flixweed excelled Russian-thistle usually in prior germination and always in prior maturity, particularly the downy chess. They fulfill their needs for water for growth and seed production before Russian-thistle is well started. In dense mixed stands where Russian-thistle is dominant, individuals of flixweed and downy chess may thrive and produce seed when Russian-thistle fails. Extreme crowding may prevent seed production in any of these plants. The capacity of Russian-thistle to withstand crowding is least and flixweed is next.

Changes in weedy plant cover are deemed of importance because Russian-thistle and the mustards are breeding hosts of the beet leafhopper (*Eutettix tenellus* Baker), vector of the curly top virus disease of sugar beets, while downy chess is not. Excessive grazing, burning, or other destructive agencies may destroy a downy chess cover or prevent its development. Any factor causing marked thinning of cover and preventing crowding may permit a Russian-thistle cover to persist year after year, as in fields grazed excessively by enclosed stock.

White top (hoary cress, Lepidium draba): Holding it under control by cultivation, followed by the establishment of a sod of pasture grasses and clovers, C. E. FLEMING and C. A. BRENNEN (*Nevada Sta. Bul. 149 (1938), pp. 7,* *fig. 1*).—Ranch land near Elko, heavily infested with white top or hoary cress, was plowed, cultivated for 1 yr., and then seeded heavily with pasture grasses, clovers, and alfalfa. The pasture plants, under conditions favorable to both, became well established after several years and crowded out the weed, although not entirely eradicating it. General applications of the control methods are pointed out, with remarks on its limitations on dry-land pastures which cannot be irrigated.

HORTICULTURE

[Horticultural studies conducted by the Bureau of Plant Industry] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1938, pp. 7, 8, 12, 13, 14, 15, 16, 17, 18*).—Brief mention is made of studies of the rotenone containing legume *Tephrosia virginiana*, fruit varieties under drought conditions, breeding of new peaches requiring less low-temperature exposure to break their winter rest and new nematode-resistant peach rootstocks, hardy fruits for the Great plains area, scab-resistant tangelos, increasing pineapple yields by chemical treatments, breeding of vegetables, effect of various treatments on breaking the dormancy of lettuce seed, improvement of the stock (*Matthiola*), the use of growth-promoting substances as an aid to rooting, the use of carbon dioxide in prolonging storage life of Bartlett pears, control of storage scald of limes, the most effective storage temperature for the cranberry, and the breeding of *Hevea* for disease resistance.

[Horticultural studies by the Arkansas Station], V. M. WATTS, J. R. COOPER, and J. E. VAILE (*Arkansas Sta. Bul. 368 (1938), pp. 71–78, 78–86, figs. 2*).—Studies discussed are the effects of fertilizer elements on the anatomy of tomato seedlings; factors influencing the production of parthenocarpic tomato fruits; cytology of Stayman Winesap flowers; fertilizers for the peach and strawberry; fertilizers for vegetables; methods of applying fertilizers; value of stable manure for vegetables; value of different sources of nitrogen; cover crops for fruits and vegetables; irrigation of tomatoes and beans; effect of thinning watermelon fruits on the crop; shading of field-grown tomatoes; spacing of tomatoes; effect of time of setting Marglobe tomatoes on yield; influence of soil reaction on the uptake of N, P, and K; varieties and breeding of fruits; varieties of vegetables; causes of uneven ripening of grapes; effect of rootstocks on growth and yield of grapes; influence of environment on sex expression in the strawberry and cucumber; winter injury to raspberries; effect of degree of pruning on yield, coloring, and sizing of apples; varieties of ornamentals and roses for landscaping; and fertilizers for roses.

[Horticultural studies by the Colorado Station] (*Colorado Sta. Rpt. 1938, pp. 31–34*).—Reports are given on variety tests of fruit, cultural studies with Montmorency cherries, culture of strawberries and raspberries, handling of soil for growing carnations, breeding of Sweet Spanish onions, fertilizers for onions, time of planting onions, breeding of head lettuce, improvement of pyrethrum, and the improvement of various vegetables by crossing and selection.

[Horticultural studies by the Kansas Station], R. I. THROCKMORTON, R. J. BARNETT, L. E. MELCHERS, G. A. DEAN, E. ABMEYER, G. A. FILINGER, W. F. PICKETT, S. W. DECKER, and F. P. ESHBAUGH (*Kansas Sta. Bien. Rpt. 1937–38, pp. 49, 50, 68–72, 125, 126*).—There are presented brief reports on the following studies: Insecticides and fungicides for the orchard; pruning of the sour cherry; soil management of the apple orchard; testing new varieties of plums; protection of raspberries, strawberries, and gooseberries from winter cold and desiccation; influence of shading and irrigation on the photosynthetic activity and performance of Concord grapes; variety trials of vegetables; and relation of leaf structure to the rate of photosynthesis of apples and grapes.

In addition, there are reported the results at the Fort Hays Substation of variety trials with cherry, plum, and iris.

[Horticultural studies by the Maryland Station] (*Maryland Sta. Rpt. 1938, pp. 23, 45, 46, 62–80, 80–82, 83, 84, figs. 4*).—Included are brief progress reports on the following studies: Sweet corn improvement; cytogenetics in the genera *Gladiolus, Tulipa, Ipomoea,* and *Verbena;* treatments for promotion of annual bearing in the apple; sod v. tillage in the apple orchard; pollination of the apple; training and pruning of the grape; pruning of the peach; variety testing of tree and small fruits; spacing of strawberry plants; apple breeding; testing of clingstone peaches for canning; spacing of peach trees; factors influencing the color of apples; effects of N fertilizers on keeping and shipping qualities of strawberries, peaches, and apples; sources of N for fruit trees; removal of spray residues; factors involved in spray injury; plant propagation with special reference to cuttings; sweet pea varieties; breeding of snapdragons; effect of day-length modification on the blooming of gladiolus; treatment of greenhouse soils; factors affecting the yield and quality of garden and canning peas; factors affecting the growth of rhubarb; breeding of the cantaloup; cultural and fertilizer studies with vegetables; breeding tomatoes for the canner; breeding of the lima bean; regional adaptation of vegetable varieties; and effect of various treatments on the growth and fruiting of the tomato.

[Horticultural studies by the Montana Station] (*Montana Sta. Rpt. 1937, pp. 33, 34, 41, 42, 46*).—Reports are presented on the following studies: Fertilizer treatment of vegetable transplants, conducted at the main station; soil management of sweet cherry orchards, the use of boron and organic matter in the control of "drought spot" of the apple, and the effect of phosphate fertilizer on vegetable crops, all conducted at the Horticulture Substation; and shelterbelt investigations, conducted at the Judith Basin Substation.

[Horticultural investigations by the West Virginia Station], L. P. BATJER, R. H. SUDDS, R. S. MARSH, L. VERNER, W. H. CHILDS, W. H. DUIS, E. P. BRASHER, K. C. WESTOVER, A. P. DYE, I. J. DUNCAN, and R. B. DUSTMAN (*West Virginia Sta. Bul. 290 (1938), pp. 20–24, 25, 29*).—Information is presented on the results of studies on the penetration of apple roots in different types of soil, sources of N for the apple orchard, potash requirements of the apple and peach, rootstocks for the apple, varieties of fruits, pruning and fertilization of the blackberry, selection of the native low-bush blueberry, resistance of peach varieties to low temperatures, hardening of tomato plants, green manures for cabbage and tomatoes, time of taking cuttings of the carnation, and the nature of the red pigment in the Winesap apple and factors affecting its formation.

Analyses of materials sold as insecticides and fungicides during 1938, C. S. CATHCART and R. L. WILLIS (*New Jersey Stas. Bul. 654 (1938), pp. 15*).—This includes in the usual form (E. S. R., 78, p. 635) the results of analyses of materials collected in 1938.

A comparative test of some wilt-resistant cabbage varieties, E. M. HUNT and A. E. HUTCHINS (Minn. Expt. Sta.). (*Minn. Hort., 66 (1938), No. 11, pp. 211, 213*).—Of nine varieties tested in 1938, Wisconsin Pride matured in the least time (64 days) and next to Wisconsin All Head produced the largest total yields. A total of 94 percent of the Wisconsin Pride heads were ready for harvest within a 4-day period. Wisconsin All Head produced the largest heads, averaging 2.98 lb., with Wisconsin Pride second with 2.86 lb.

Nutritional studies of celery in relation to certain physiological changes in cold storage, L. F. OUNSWORTH (*Sci. Agr., 19 (1938), No. 2, pp. 57–65, pls. 2, fig. 1*).—Readings taken at different intervals during the storage period on osmotic pressure, pithiness, color, and break-down of celery grown under differential fertilizer treatments indicated that under the conditions of the experiment (namely, a temperature of 32.1°±4.06° F. and a relative humidity between 93 and 97 percent) P treatments of the soil and the duration of the storage period were the most important factors concerned with storage behavior. N applications were not as important as those of P, but it was evident that abundant N was required. K variations did not result in any significant effects on storage behavior.

Seedstalk and bulb development in the onion (Allium cepa L.), H. C. THOMPSON and O. SMITH (*[New York] Cornell Sta. Bul. 708 (1938), pp. 21, figs. 8*).—In the three varieties Ebenezer, Yellow Globe, and Red Wethersfield it was found that large sets (from 13/16 to 1⅛ in. in diameter) resulted in a much larger percentage of seedstalks than did either medium (from ⅝ to ¾ in.) or small (from ⅜ to ⅝ in.) sets. The temperature of the storage had a marked influence on subsequent seedstalk development and the yield of marketable bulbs, especially in the case of the medium and large sets. The largest percentage of seedstalks and the lowest marketable yields were produced by sets stored at 40° and 50° F. A storage temperature of 30° or 32° was most favorable, and a high temperature of from 60° to 70° was not satisfactory because of growth and shriveling in storage.

The influence of variety was shown in the fact that under like conditions Ebenezer developed lower percentages of seedstalks than did the other two kinds. With sets that had been stored at temperatures least favorable for seedstalk development, the larger the sets the higher was the yield of marketable bulbs. The percentage of split or divided onions was much greater from large than from medium or small sets. No apparent correlation was noted between the rate of respiration in storage and early seedstalk development. That relatively low growing temperatures (from 50° to 60°) favored seedstalk development was shown in the fact that these temperatures developed seedstalks under normal length of day of winter and early spring. An increase in length of day hastened seedstalk development. At from 70° to 80° seedstalks did not develop either with normal or lengthened days.

Both temperature and length of day were evidently concerned in bulb formation in the onion. No bulbing occurred during winter or early spring at any of three ranges of temperature used, namely, from 50° to 60°, 60° to 70° 70° to 80°. With a 15-hr. day and a temperature of from 50° to 60° no bulbing occurred, but when the temperature was raised to from 60° to 70° or 70° to 80° bulb formation took place.

A test of the newer tomato varieties, T. M. CURRENCE. (Minn. Expt. Sta.). (*Minn. Hort., 67 (1939), No. 2, pp. 38, 39*).—Of 16 tomato varieties and strains grown under uniform conditions in 1938, Earliana produced the largest total yields but the fruit was lowest in the percentage rating as to smoothness. Marglobe strains and Rutgers proved especially desirable from the standpoint of smoothness and shape. There appeared to be an inverse relationship between large early yields and smoothness of the fruits.

Wilt-resistant tomato varieties released by the Illinois Station, W. A. HUELSEN (*Illinois Sta. Circ. 490 (1939), pp. 22, figs. 9*).—This revision of Circular 448 (E. S. R., 75, p. 201) includes a description of one additional tomato, Illinois Baltimore, and additional yield records on the varieties mentioned originally.

Physiological studies on after-ripening and germination of fruit-tree seeds, I. C. HAUT (*Maryland Sta. Bul. 420 (1938), pp. 52, figs. 7*).—Using a temperature of 3° C. (37.4° F.), the author obtained a high percentage of germination following an afterripening period of 45 days with the pear, 60 days with the apple, 75 days with the peach, 88 days with the Mahaleb cherry, and 100 days with the Mazzard cherry. Drying seeds at room temperature prior to afterripening did not adversely affect the percentage of germination provided the seeds were subsequently afterripened at low temperature in a moist condition. Seeds stratified dry at a low temperature did not afterripen. Drying following afterripening resulted in a very marked reduction in viability which could not be restored by restratification. In the peach, piling of fruits to secure rotting of the pulp caused considerable injury to the seeds. In the peach and Mazzard cherry the stony endocarp offered mechanical resistance to the expanding embryo and often retarded or reduced germination. None of the various treatments, such as immersion in warm water, acid treatment, or etherizing, designed to hasten the afterripening of pear and apple seeds proved successful.

No significant changes in fats, total sugars, sucrose, free reducing substances, titratable acid, and alcohol-soluble and insoluble nitrogen occurred during the afterripening process in McIntosh apple, Elberta peach, and Mazzard and Mahaleb cherries. No starch was found in the seeds. Catalase activity increased progressively until the seeds were fully afterripened, when an activity nearly twice that of the untreated seeds was reached.

Winter injury of fruit trees in Ohio, L. HAVIS and I. P. LEWIS (*Ohio Sta. Bul. 596 (1938), pp. 41, figs. 16*).—Beginning with a historical account of severe winters in Ohio as revealed in the literature, the authors discuss specifically damage during the winter of 1935–36. A combination of unfavorable factors, including a short, moist growing season in 1935, an early October frost which injured leaves, and a very rapid drop in temperature in late January, operated to effect very drastic injury to apples, peaches, and other fruits. The effects of soil type and management, fertilizers, variety, pruning methods, conditions as to production, spraying, etc., on winter injury are outlined, and recommendations are made as to the locating of orchards, management practices, use of hardy understocks, etc., that would lead to a minimum of injury.

Orchard cover crops, W. TOENJES (*Mich. State Hort. Soc. Ann. Rpt., 66 (1936), pp. 110–116*).—Observations at the Graham Horticultural Substation near Grand Rapids from 1933 to 1936 showed soybeans to produce the most dry weight per acre among the legumes, while of the nonlegumes the millets, sorghums, and field corn were most promising. Amber sorghum, the most productive of all crops, averaged over 5 tons of dry matter per acre per year.

Some results of mineral fertilizers on apple seedlings, G. H. DICKSON (*Sci. Agr., 19 (1938), No. 2, pp. 105–109, figs. 6*).—Observing foliar injury in a number of trees in an unsprayed block of Salome seedlings, the author treated certain groups with muriate of potash, with superphosphate, and with combinations of the two. Striking results were obtained in the potash-treated trees, whereas superphosphate corrected the trouble only to a limited degree. Differences in the degree of response in different plats of the same fertilizer treatment led to a study of the soil, which showed that differences in soil texture may also be concerned with potash-deficiency manifestations.

Rootstock and scion relationship in apple trees, D. S. BLAIR (*Sci. Agr., 19 (1938), No. 2, pp. 85–94*).—Using various Malling rootstocks as intermediate sections in double-worked trees, the author found that the so-called rootstock effects upon growth and precocity of the scion may be obtained by the simple insertion of an intermediate stem-piece between the absorbing root system and the scion.

The temperature factor in fruit production, M. A. BLAKE (*N. J. State Hort. Soc. News, 19 (1938), No. 6, pp. 1047–1049, figs. 3*).—The author points out the intimate relation between varietal adaptation to any given region and the mean temperatures, especially those prevailing during the growing season. For example, Baldwin and McIntosh develop their highest quality when grown where the September mean does not greatly exceed a temperature of from 60° to 63° F.

Effect of certain treatments on the keeping of fruit [trans. title], H. Kessler (*Landw. Jahrb. Schweiz, 52 (1938), No. 8, pp. 868–896, figs. 9; Fr. abs., pp. 895, 896*).—Fruit of apple trees which had been severely cut back and thereby given unusual exposure to the light was, especially in years of light cropping, less resistant to storage disorders. Very unfavorable results followed ringing of limbs accompanied by heavy thinning of the crop. Ringing alone or thinning alone did not always influence keeping quality. Fruit from ringed and partly defoliated branches kept less favorably than the controls. Where the supply of carbohydrates was large and the number of fruits was small, fruit ripened earlier and kept poorly. Varieties susceptible to flesh browning required early harvesting. Young trees properly pruned and sprayed, supplied with complete fertilizer, and bearing from average to large crops bore the best-keeping fruit.

Pollination of Williams (Bartlett) pear in New South Wales, R. E. P. Dwyer, F. T. Bowman, and A. V. Robinson (*N. S. Wales Dept. Agr., Sci. Bul. 62 (1938), pp. 58, figs. 11*).—Satisfactory commercial crops were obtained at Bathurst under conditions of only limited cross-pollination. Examination of the seed contents showed many seedless fruits except where Bartlett (Williams Bon Chretien) was planted near other varieties. Vigorous trees produced a greater proportion of seedless fruits than did nonvigorous trees. A high correlation was noted between the percentage of seedless fruits and losses as windfalls under adverse weather conditions. Under controlled conditions Bartlett showed a very low degree of self-fertility, averaging only one seed in 163 self-pollinations. There was a considerable degree of intersterility in reciprocal crosses between Seckel and Bartlett. Most of the important pears grown in New South Wales were interfertile with Bartlett. The parthenocarpic tendency of Bartlett masked the value of cross-pollination.

The cherry varieties of Switzerland, F. Kobel (*Die Kirschensorten der deutschen Schweiz. Bern: Benteli A.-G., 1937, pp. 256, pls. 84, figs. 4*).—This book contains descriptions of varieties together with information as to botany, pollination requirements, classification, etc.

A note on the distribution of chemical compounds in the inner and outer portions of the flesh of the Kelsey plum, I. Donen (*Roy. Soc. So. Africa, Trans., 26 (1938), pt. 1, pp. 89–92*).—Sugars and acids were somewhat higher in concentration in the outer than in the inner layers. Total N was found always higher in the inner than in the outer regions. Protein N was fairly evenly distributed, but soluble N was higher in the inner tissues. The percentage of total N utilizable for protein synthesis was almost twice as great in the outer as in the inner layers. The results indicate the need of careful mixing of tissues prior to analysis.

Investigations on the adaptability of grape root stocks to Gulf Coast conditions, C. A. Magoon, J. R. Magness, W. S. Anderson, and S. R. Greer. (U. S. D. A. and Miss. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 466–470*).—Observations in July 1937 on 42 grape stocks planted in the spring of 1932 at Poplarville showed 9 to rate very good or better in vigor. Eleven of the 42 failed completely. Of the 9 superior forms, 4 belonged to *Vitis champini*.

Breeding new strawberry varieties, G. M. Darrow and E. B. Morrow. (Coop. U. S. D. A. et al.). (*North Carolina Sta. Bul. 320 (1939), pp. 12, figs.*

4).—Discussing briefly the situation as to strawberry varieties in North Carolina, the authors describe and discuss three new varieties—Fairmore, Daybreak, and Eleanor Roosevelt—all of which show promise in the State. Data are presented on the comparative length of runners of several varieties as grown at Atkinson, Swannanoa, and Willard and on yields at Willard under different cultural systems.

Relation of magnesium deficiency in grapefruit leaves to yield and chemical composition of fruit, B. R. Fudge (*Florida Sta. Bul. 331* (*1939*), *pp. 36, figs. 5*).—In grapefruit trees of the same age, on the same rootstock species, and receiving identical cultural treatment there was observed a marked superiority in growth, yield, and condition of the leaves in favor of seedless varieties such as Marsh. In the seed-producing kinds a loss of chlorophyll was noticeable in early autumn, followed in many instances by partial defoliation. As a result of defoliation the trees in many cases were thrown into a condition of alternate bearing. Analyses of the fruit, seed, and leaves of vigorous seedlings and of bronzed trees showed conspicuous differences in chemical composition. All mineral elements determined, with the exception of aluminum, were higher in the seedy than in the seedless fruits. The seeds of the seedy varieties were higher in certain elements, including potassium and magnesium. Because of the great difference in the numbers of seeds per fruit, the difference in total content of the various elements was very large. The bronzed leaves were lower in several elements, notably magnesium, which was approximately one-tenth that of healthy leaves of the same variety and age. It was evident that the magnesium requirements of the fruit and seeds, in the presence of inadequate soil supplies of magnesium, had created a deficiency in the adjacent foliage. Often the leaves some distance from the fruit were unaffected. The cluster type of bearing in the seedy varieties accentuated the disturbance. Even in Marsh the leaves near the fruit contained only one-half the magnesium found in the more distant leaves. The alternate bearing following defoliation is described as a result of the poor physical condition of the tree rather than as a direct result of magnesium deficiency. Treatment of the soil with magnesium-containing materials is suggested.

Grapefruit maturity studies in Arizona, R. H. Hilgeman and J. G. Smith. (Ariz. Expt. Sta.). (*Calif. Citrog., 24* (*1938*), *No. 2, pp. 54, 64*).—Tests on Salt River Valley grapefruit in 1937 showed that juice percentage increased steadily from 25.6 on September 8 to 36.7 on November 19, with little change thereafter. The percentage of peel decreased steadily up to November 19, with little change thereafter. The percentage of acid decreased rapidly to October 30 and increased slightly during November and December. Apparently, there is a rather wide range of percentage of juice and of Brix-to-acid ratio in which grapefruit is satisfactory for eating. In general, higher Brix-to-acid ratios were obtained from large than from small fruits. Seasonal differences in percentage of juice and ratio of Brix to acid indicated a difficulty in setting up standards. An increase of 10 percent in color requirement is suggested as a measure leading to better consumer satisfaction.

Investigation into cause of lemon tree decline, F. F. Halma. (Univ. Calif.). (*Citrus Leaves, 18* (*1938*), *No. 6, pp. 3, 4, 26, figs. 9*).—Based on field studies and on the results of propagations from vigorous and nonvigorous trees, the conclusion is presented that the type of lemon-tree decline considered in the paper is caused primarily by the propagation of inherently weak strains. It is suggested that scions be taken from parental trees at least 25 yr. old and characterized by good balance between vegetative growth and abundant production of desirable fruit types.

Effects of reproduction by nucellar embryony on clonal characteristics in citrus, R. W. Hodgson and S. H. Cameron. (Univ. Calif.). (*Jour. Heredity, 29 (1938), No. 11, pp. 417–419, fig. 1*).—Observations on two pairs of trees, all on sweet orange rootstocks but budded respectively with buds taken from the Paper Rind orange and from a nucellar seedling thereof, showed the trees derived from the asexually reproduced seedling to possess greater vigor, more upright growth, greater thorniness, and lower seed content in the fruit. The pair of trees from Paper Rind, on the other hand, came into fruiting earlier. The maximum seed content in the original clone was 27 and in the nucellar derivative 8.

Nucellar embryony and juvenile characters in clonal varieties of citrus, H. B. Frost. (Calif. Citrus Expt. Sta.). (*Jour. Heredity, 29 (1938), No. 11, pp. 423–432, figs. 3*).—Notable differences observed in the vegetative vigor, thorniness, and flowering capacity of established citrus varieties and their nucellar progeny led the author to a discussion of the possibility of senescence in clones. There was noted a tendency for thorniness to decline with growth extension in the nucellar seedlings, but very little, if at all, in the original trunks. The different degrees of thorniness tended to be propagable. The author concludes that the regularly occurring age changes are not due to infectious diseases or accumulation of inert materials in the cells, but rather to persistent modification of the meristematic cells, which are propagated in ordinary somatic division but erased in seed formation.

Vitamin B_1 and the germination of pollen, W. B. Dandliker, W. C. Cooper, and H. P. Traub. (U. S. D. A.). (*Science, 88 (1938), No. 2296, p. 622*).—Papaya pollen of four varieties was tested for germination in Van Tiegham cells using a medium of 4 percent sucrose and 0.75 percent agar, with and without the addition of crystalline vitamin B_1. In all except one case, the addition of 100γ B_1 per cubic centimeter resulted in a significant increase in germination. Since the increase in most cases was greater during the first 2 hr. than after a 4-hr. period, the authors conclude that the main effect of B_1 was to accelerate germination. The addition of indoleacetic acid in concentration ranging from 1/10γ to 100γ per cubic centimeter had no material influence on germination of papaya pollen.

The application of controlled atmospheres in the storage of fruits, W. R. Phillips (*Sci. Agr., 19 (1938), No. 2, pp. 66–68*).—Core flush, a storage trouble definitely associated with low temperature in the case of the McIntosh apple, was avoided by the use of a temperature of 39° F. and a modified atmosphere of 7 percent CO_2, 14 percent O_2, and 79 percent N. Varieties differed in their optimum concentrations, and even in a single variety the favorable concentration varied with the temperature and with the maturity of the stored fruits. The results indicated that for the attainment of maximum quality in gas-stored McIntosh apples well-colored, well-matured fruit should be used.

Heating and lighting greenhouses with intermittent light, J. M. Arthur and E. K. Harvill (*Contrib. Boyce Thompson Inst., 10 (1938), No. 1, pp. 15–44, figs. 6*).—Comparing an insulated, artificially lighted greenhouse (E. S. R., 74, p. 469) with an ordinary greenhouse also supplied with supplemental light, it was found that dry weight and flowering were greatly increased in both as compared with control houses without supplemental light. Dry weight, however, was less in the insulated house, apparently due to the restricted CO_2 supply resulting from the low rate of air exchange. The comparative growth and development of hyacinths, *Lilium longiflorum,* and gladiolus in the different environments is described.

Cloth houses, A. Laurie and C. Link *(Ohio Sta. Bul. 594 (1938), pp. 37, figs. 5)*.—In addition to presenting general information on the construction of cloth-covered houses and the management of plants grown thereunder, the authors discuss the results of experiments with asters, chrysanthemums, and various annuals and perennials. In general, the authors conclude that the cloth house offers an opportunity for the commercial production of summer flowers of superior quality. Under white cloth there was a reduction of light amounting to 35 percent and in temperature of from 5° to 8° F. The relative humidity under the cloth was somewhat higher than outside. Asters responded to shading with black cloth from 5 p. m. to 7 a. m., beginning from 7 to 8 weeks after planting. The use of supplemental light on asters in the seedling stage hastened flowering according to the variety grown. Under cloth, many annuals produced larger flowers with longer stems and better color. The shading of pompon chrysanthemums with black cloth from 5 p. m. to 7 a. m. resulted in earlier flower production. Roses produced under cloth were equal or superior to those grown in the greenhouse in the summer season. The cloth greenhouse proved desirable, also, for holding certain stock plants such as pelargoniums.

Some effects of mulches for winter protection of herbaceous perennials, R. C. Allen and S. E. Wadsworth. (Cornell Univ.). *(Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 742–746, fig. 1)*.—Of various materials used for covering herbaceous plants, such as *Bellis perennis*, *Dianthus plumarius*, and the like, glass wool proved outstanding. Under wool, the soil remained in good condition, and it was apparent that transmitted light was helpful in retaining the leaves in a healthy, green state. Glass wool had the advantage of sterility, translucency, and aeration. The soil temperature at 2 in. deep was higher under all the mulches than in the open. Some of the mulches, such as shredded sugarcane, produced a continuous wet, soggy condition. Snow, while it remained on the soil, was an effective protection.

Nutritional deficiencies in greenhouse flowering plants, A. Laurie and A. Wagner. (Ohio State Univ.). *(Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 759–761)*.—Information is presented on the effects of B, Ca, Fe, Mg, Mn, and S deficiencies on the growth of gardenias, chrysanthemums, poinsettias, hydrangeas, begonias, snapdragons, roses. and primulas. Ca omission resulted in the death of nearly all the feeding roots within 2 or 3 weeks. Fe deficiency resulted in severe chlorosis. A lack of Mg caused a great reduction in growth and chlorosis of the leaf tissue between the veins. Mn deficiency also stunted growth but to a lesser degree than did Mg. S deficiency resulted in decreased height development, with chlorosis, characterized, however, by light-colored veins.

Composition of the rhizome, stem, and leaf of some horticultural forms of Canna in relation to their possible use, C. W. Culpepper and H. H. Moon *(U. S. Dept. Agr. Circ. 497 (1938), pp. 22)*.—With plant material grown at Arlington Farm, Va., it was found that the composition of the rhizome varied from season to season in any given variety and that there was a wide range in composition of different varieties. Abundant rainfall during July and August, followed by moderate rainfall in September and October, favored a high solids and polysaccharide content, apparently through the influence on degree of maturity. The rhizomes of ornamental forms had a considerably higher tannin and a somewhat higher total N, nitrate N, and acidity content. The composition of different parts of the plant varied greatly in the edible forms. The yield of rhizomes and tops varied greatly in the different varieties, but the production of large amounts of tops was not necessarily correlated with a heavy crop of rhizomes. There appeared little relationship between yield and the composition of the rhizomes. The flavor of the cooked rhizomes resembled that of salsify, but there was a tendency for the material to discolor during preparation and to contain an objectional amount of fiber. There was, however, considerable variation in these characters among different clones.

Gardenia nutrition in relation to flower bud development, L. Burkhart and H. M. Biekart. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 768, 769*).—Among factors found important in limiting flower production during the late fall months were too vegetative growth in late August and early September, too high humidity in August, and too close spacing of plants. Bud drop was increased by factors favoring bud development and bloom production, suggesting that dropping is the result of competitive factors set up by the stronger and more active buds. Some evidence was secured that individual plants vary in their inherent productiveness. Sand was found a very desirable medium in which to grow gardenias.

Production of Easter lily bulbs in Louisiana, F. D. Cochran and D. L. Gill (*Louisiana Sta. Circ. 22 (1939), pp. 12*).—Stating that the production of lily bulbs in Louisiana has indication of becoming an important industry, the authors discuss the growing of *Lilium longiflorum*, with special reference to the Creole variety. Several serious virus diseases and other troubles are discussed with suggestions for control. Propagation, planting, cold protection, harvesting, and breeding possibilities are considered.

Mineral nutrition of the rose, L. Burkhart. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), p. 758*).—Observations on Briarcliff rose cuttings grown in sand cultures supplied with nutrients lacking in single elements showed certain well-defined deficiency symptoms which are described. Ca omission resulted in a break-down of the root tips as early as the end of the first week of treatment. N omission resulted in the yellowing of older leaves within a few days. P omission resulted in a rather spindling type of growth, with leaves becoming very dark green and roots decidedly limited. A lack of B did not, in a 3-mo. period, produce any noticeable symptoms.

Effects of short periods of low temperature on flower production in stocks (Matthiola), S. L. Emsweller and H. A. Borthwick. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 755–757*).—Plants of the Column Lavender stocks, germinated and held in the greenhouse the temperature of which was maintained at from 70° to 75° F. and the photoperiod at 17 hr. by supplemental Mazda light (conditions which inhibited flower-bud formation), were transferred for 3, 6, 9, 12, and more days to another room of 17-hr. day length at 55° temperature. All plants, even the 3-day lots, developed flower buds. In a later test, even 2 days sufficed to induce flower-bud formation. No flowers developed in the control house or in plants given a single day's exposure at from 50° to 55°.

Selection of double flowered stocks in small plant stage, S. L. Emsweller. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), p. 747*).—When seed of the ever sporting genotype was sown, a combination of two characteristics, namely, more rapid growth and the earlier appearance of indentations on the young leaves, permitted the selection of double-flowering plants to a surprising degree of accuracy.

Effects of mineral nutrient deficiencies and excesses upon the vegetative growth and flowering of sweet peas, K. Post. (Cornell Univ.). (*Amer. Soc. Hort Sci. Proc., 34 (1937), p. 761*).—Excess of soluble N in the soil resulted in a hardening of the vines and was offset by the incorporation of chopped straw or the use of nutrients low in soluble N. Applications of phosphate were helpful if limiting at the time. Bud drop was most severe when N was intermediate in concentration. The manifestations of excessive and deficient amounts of N, P, and K are described.

Our shade trees, E. P. Felt (*New York: Orange Judd Pub. Co., 1938, pp. 187, pls. 31, fig. 1*).—Herein is presented general information as to desirable species, planting, pruning, protection from pests, wound treatment, etc.

Growth of pin oak (Quercus palustris): Report of seven year's observations, A. M. S. Pridham. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 739–741*).—In data based on measurements of trunk-girth increment there was found no statistical difference related to the manner of planting, although loose-planted trees made the greater increase. Fall planting was consistently better than spring planting. Soil type was an important factor, with clay showing consistent and significant gains over gravelly soils. No pruning was better than any of the types employed, but care in planting was more effective than any pruning treatment. Differences in growth due to seasonal influences were greater than those due to any other single factor.

Use of wax emulsions on nursery stock (*Michigan Sta. [Bien.] Rpt. 1937–38, p. 14*).—Encouraging results from spraying white pines with wax emulsions at planting are noted.

FORESTRY

Report of the Chief of the Forest Service, 1938, F. A. Silcox (*U. S. Dept. Agr., Forest Serv. Rpt., 1938, pp. IV+55*).—Additional information (E. S. R., 78, p. 635) is given on the forestry situation in the United States, the relation of the forests to the welfare of the Nation, the administration of the national forests, new forestry legislation, etc.

[Forestry] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1938, pp. 133–135*).—There are considered the relationship between forestry and the national welfare, and the national forests from the standpoint of area, fire and flood control, and use in providing timber, grazing, and recreation.

[Forestry studies by the Arkansas Station], R. D. Stevens and R. W. Hess (*Arkansas Sta. Bul. 368 (1938), pp. 86–90*).—Included are brief reports on silvicultural practices in white oak stands, the comparative growth of different upland oaks on site 2 locations, site index and tree-form expression in hardwoods, growth of cottonwood stands, costs of operating portable sawmills, planting of cottonwood cuttings and germination tests with cottonwood seeds, relation of site to growth of shortleaf pine, silvicultural management of farm woodlots, and the growth of different species in a plantation established at Fayetteville in 1935.

[Forestry studies by the West Virginia Station], W. C. Percival, L. E. Lutz, W. H. Pierre, W. M. Broadfoot, E. A. Marten, and G. G. Pohlman (*West Virginia Sta. Bul. 290 (1938), pp. 25–28*).—Studies in cooperative marketing of lumber products and of the decomposition of leaves of different forest species are discussed.

Dual-purpose pines (*U. S. Dept. Agr. Leaflet 168 (1939), pp. 8, figs. 5*).—Information is presented as to the profitable management of slash and longleaf pines for the production of naval stores and wood.

Loblolly pine seed dispersal, A. L. MacKinney and C. F. Korstian. (U. S. D. A. et al.). (*Jour. Forestry, 36 (1938), No. 5, pp. 465–468, figs. 2*).—During the fall and winter of 1936–37 records were taken at weekly intervals on 50 seed traps set up in a Latin square design in and adjacent to a 70-year-old loblolly pine stand in the Duke Forest at Durham, N. C. It was found that seeds started falling on October 14 and continued until the week of June 23, with the maximum fall during the week of November 18. In general, the fall of seed was heaviest under the uncut stand and was lightest on the leeward side of a clear-cut strip. Viability of the seed decreased progressively with the season.

Can jack pine be regenerated without fire? F. H. Eyre. (U. S. D. A. and Univ. Minn.). (*Jour. Forestry, 36 (1938), No. 10, pp. 1067–1072, figs. 3*).—An effective and fireless method of regenerating jack pine is proposed as a result of studies which showed that by disturbing the surface soil and utilizing the heat of midsummer to release the seed from cones on scattered slash good reproduction could be secured following cutting.

Use of indolebutyric acid to stimulate the rooting of dormant aspen cuttings, A. G. Snow, Jr. (*Jour. Forestry, 36 (1938), No. 6, pp. 582–587, figs. 2*).—Studies with cuttings of dormant wood collected at different periods from 1-year-old stump sprouts near Mount Carmel, Conn., indicated that the time of taking cuttings is a most important consideration. Those taken in late March when the buds were beginning to swell responded very positively to chemical treatment, whereas treatment effects were of little or no significance in early February or late January. Abundant callus formation was not necessarily an indication of potential root formation. Under the conditions of the experiment, treatment for 27 hr. in a solution of 10 mg of indolebutyric acid in 1 l of water gave excellent results.

Effect of indolebutyric acid on rooting of greenwood cuttings of some deciduous forest trees, M. Afanasiev. (U. S. D. A. et al.). (*Jour. Forestry, 37 (1939), No. 1, pp. 37–41, figs. 3*).—Working at Frye, Maine, in the summer of 1937, the author found that greenwood cuttings of gray birch, white birch, red maple, and a hybrid poplar responded favorably to treatment with indolebutyric acid. Negative results were secured with cuttings of aspen and hard maple. There was evidence that each species has definite optimum requirements.

Root habits of longleaf pine and associated species, L. J. Pessin. (U. S. D. A.). (*Ecology, 20 (1939), No. 1, pp. 47–57, figs. 3*).—Observations in southern Louisiana and Mississippi on longleaf seedlings approximately 13 yr. old and growing in dense stands showed that under such conditions the root system of the pine does not always develop symmetrically because of competition with old roots and with charcoal and gravel pockets. The occurrence of most of the lateral roots within the upper foot of soil, where most of the roots of grasses and herbs associated with pines also occur, suggested a critical competition for water during drought periods. The total absence or slow growth of longleaf pine seedlings in the vicinity of *Quercus cinerea* seedlings is explained on the basis of the extensive root system of the oak.

The use of photoelectric cells for sampling light in forest stands, E. M. Bacon. (Univ. Calif.). (*Jour. Forestry, 37 (1939), No. 1, pp. 55–60, fig. 1*).—Believing that the use of a flat, sensitive surface has resulted in a high degree of error due to variations in the angle of inclination, the author proposes a new method embodying the use of an integrating sphere enclosing the photoelectric cell. Observations upon the sunlight at the point nearest the ground where the green needles occurred in white pine, hemlock, and red pine showed averages of 6, 4.8, and 3.1 percent in one stand and 5.1, 3.7, and 3.1 percent in another stand, respectively.

A study of the tolerance of trees to breakage by ice accumulation, W. C. Croxton (*Ecology, 20 (1939), No. 1, pp. 71–73*).—Observations in Rushville, Ill., following the disastrous sleet storm of January 7, 1937, showed marked differences in the resistance of various species to breaking. Among trees, the Babylon weeping willow, the European white birch, the yellow birch, and the American elm were extremely susceptible to injury. Poplars, silver maple, and white pine also exhibited serious damage. The breaking of limbs was not essentially fatal, particularly if the trees were properly cared for subsequently.

Soil temperatures during forest fires in the longleaf pine region, F. Heyward (*Jour. Forestry, 36 (1938), No. 5, pp. 478–491, figs. 7*).—With the aid of thermocouples, soil temperatures were recorded during 44 experimental fires involving different fuel types in longleaf pine forests. At depths of from 0.125 to 0.25 in. there occurred temperatures ranging from only slightly higher than those of the air up to 274° F. At 0.5-in. depths soil temperature was much lower than at 0.125 in. At 1 in. the temperatures were only slightly higher than those in the control plats. No recorded soil temperature approached the charring temperature (from 350° to 400°) for dry organic matter within the soil. In was indicated that the majority of forest fires in the longleaf pine region do not cause sufficient heat to impoverish the soil and that the moderate rise in heat may be actually beneficial.

Experiments with chemicals in killing vegetation on firebreaks, G. J. Ikenberry, H. D. Bruce, and J. R. Curry. (U. S. D. A.). (*Jour. Forestry, 36 (1938), No. 5, pp. 507–515*).—Arsenic in one form or another was found highly effective both for killing stumps and for sterilizing soil designed to serve as fire barriers. Sprouting oak stumps were killed by sodium chlorate, sodium arsenite, or 27° Diesel oil. Treatment in autumn proved most successful in sterilizing soil with chemicals. Because of the hazard to man and animals, the widespread use of arsenic is not recommended for any purpose. The effectiveness of different chemicals varied with the concentrations used.

Fire Control Notes, January 1939 (*U. S. Dept. Agr., Forest Serv., Fire Control Notes, 3 (1939), No. 1, pp. II+40, figs. 14*).—This periodical devoted to the technic of forest fire control presents, in the usual manner, short articles relating to equipment, methods, firebreaks, effects of lightning, etc.

Lumber production for the northern Rocky Mountain region, I. V. Anderson. (U. S. D. A.). (*Jour. Forestry, 36 (1938), No. 5, pp. 504–506, fig. 1*).—This article describes trends in the industry from 1869 to 1936. Ponderosa and western white pines have been the principal lumber species during the period with western white taking the lead in 1927.

Lumber: Its manufacture and distribution, R. C. Bryant (*New York: John Wiley & Sons; London: Chapman & Hall, 1938, 2. ed., pp. XXIV+535, figs. 132*).—The purpose and plan of this revision remain those of the first edition (E. S. R., 47, p. 540), but it presents improvements in equipment and in manufacturing methods made in the intervening 16 yr. It contains also a discussion of "the post-war adjustments . . . which were designed to bring lumber production and distribution into harmony with the new economic era."

DISEASES OF PLANTS

[Plant disease work of the Bureau of Entomology and Plant Quarantine] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar. Rpt., 1938, pp. 15, 16, 25–33, 39–42*).—Progress reports are included on the control of phony peach and peach mosaic diseases; citrus canker and Dutch elm disease eradication; white pine blister rust control; black stem rust quarantine enforcement; and barberry eradication.

[Plant disease studies by the Bureau of Plant Industry] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1938, pp. 2, 3, 4, 7, 9, 10, 11, 12, 13, 14, 17, 18, 22, 23*).—The results of work on the following subjects are briefly noted: Corn wilt carried by flea beetles, Thatcher wheat surviving rust epidemic, Hope wheat hybrids resisting stem and leaf rust, Chevron barley resisting stem rust and scab, crown rust resistant oats for the deep South, new smut-resistant oats for irrigated farms, new disease-resistant oats for the Corn Belt, alfalfa resistance to bacterial wilt, crop rotation and disease reduction in field peas, calcium cyanamide in the control of mildew in hops, head smut of grasses confined to individual host species, rust damage to young southern pines, Dutch elm disease spores carried by the tree sap, *Nectria* canker in relation to stand objective and management, air currents in the dispersal of white-pine blister rust spores for long distances, heartwood of wind-thrown Douglas fir and western red cedar resisting decay, frequent spraying for control of leaf spot damage to dewberry, spraying for control of mango anthracnose, proper bordeaux spray reducing damage to walnut leaves, pecan tree requirement of zinc, resistance of sugar beet variety U. S. 217 to leaf spot, reduction of damping-off when sugar beets follow grain crops, fungi attacking clover root curculio and corn earworm, wheat nematodes in galls remaining alive after 16 yr., certain gardenias and marigolds resisting root knot nematode, physiological strains of bud and leaf nematode, permanent tobacco beds satisfactory if steam sterilized, tobacco varieties resistant to black root rot discovered, tobaccos from Central America resistant to root knot, and blue mold (downy mildew) in tobacco beds controlled by gas treatments.

The Plant Disease Reporter, January 15 and February 1 and 15, 1939 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 23 (1939), Nos. 1, pp. 21, figs. 4; 2, pp. 23–36, figs. 5; 3, pp. 37–53, figs. 2*).—The following issues contain items of interest as indicated:

No. 1.—Psyllid yellows of potato in 1938; club root of crucifers in California, by C. M. Tompkins and P. A. Ark; recurrence of white rot (*Sclerotium cepivorum*) of onion in Virginia, by H. T. Cook; control of leaf spot of peanut with copper and sulfur fungicides, by L. I. Miller, in which sulfur dusts, bordeaux mixture, and lime-sulfur proved effective, while wettable sulfur or pyrethrum did not, and liquid lime-sulfur caused severe leaf burn; notes on apple, peach, and cherry diseases in the Ozark section of Arkansas in 1938, by J. C. Dunegan; notes on apple, pear, peach, and cherry diseases in the Ozark section of Missouri in 1938, by M. A. Smith; "pink-fruit" or necrosis of sour cherry in western Washington, by E. L. Reeves, G. A. Huber, and K. E. Baur; brief notes on the scarcity of blotch cankers on Kansas-grown apple seedlings, and *Valsa* cankers on peach trees in Pennsylvania; notes on several plant diseases in western Washington (yellow rust *Phragmidium rubi-idaei*) on red raspberry, crumbly fruit in red raspberry, mosaic in black raspberry, crown and cane gall (*Bacterium tumefaciens*) on evergreen blackberry, "soft rot" (*Botrytis* sp.) of evergreen blackberry, brown spot on peas, bronze top of alfalfa, and bronzing and dwarfing of hops, by K. E. Baur and G. A. Huber; some unusual diseases of ornamentals reported in New York during 1938 (Verticilliosis of Chinese lantern, *Phytophthora* wilt and stem rot of Kalanchoe, rust on an orchid (*Cattleya dowiana aurea*), and several more common diseases that were unusually severe and economically important this year), by A. W. Dimock; downy mildew on snapdragon in California, by M. R. Harris; a correction in the crop loss estimates for 1937; and psyllid yellows in Montana in 1938, by H. E. Morris.

No. 2.—Range extensions for *Naucoria cerealis* in Illinois in 1938 and an annotated key to 27 species in the genus, by G. H. Boewe; observations on cotton wilt in relation to nematodes and certain mineral deficiencies, and a survey of cotton boll rot diseases and the fungi associated with them, both by P. R. Miller; angular leaf spot of cotton in irrigated valleys of Arizona and New Mexico, by C. J. King and R. B. Parker; apple diseases in Pennsylvania, by R. S. Kirby, A. H. Bauer, G. L. Zundel, O. D. Burke, and H. W. Rankin; fire blight in Pennsylvania and Illinois in 1938; psyllid yellows in Nebraska, 1938, by J. H. Jensen; and brief notes on *Sclerotium cepivorum* on garlic in California, and *Diplodia* on lightning-injured cotton plants in Georgia.

No. 3.—Notes on avocado, mango, citrus, guava, and minor fruit diseases in Dade County, Fla., in 1938, by G. D. Ruehle; progress in eradication of peach mosaic and citrus canker (*Bacterium citri*); further notes on the distribution of witches' broom of black locust in Maryland, District of Columbia, Pennsylvania, Ohio, Virginia, Tennessee, North Carolina, and Arkansas, compiled by T. J. Grant; rapid killing of pines by *Cronartium ribicola;* Dutch elm disease fungus (*Ceratostomella ulmi*) recovered from adult elm bark beetles (*Hylurgopinus rufipes*); American elm beset with another epidemic killer—a virus-induced phloem necrosis (E. S. R., 80, p. 361); new tree diseases reduce food supplies of animals; killing epidemic threatens London plane, a "city" tree; two unusual fungi in the Pacific Northwest (*Sclerotium delphinii* on *Daphne odora* and *Boydia insculpta* on holly), by J. A. Milbrath; physiologic races of stem rust identified in 1938; hemipterous insects and diseased cotton blooms; first report of tobacco downy mildew in 1939 (Cook County, Ga., February 4); and another correction to the 1937 crop loss estimates.

Plant pathology (*Arkansas Sta. Bul. 368 (1938), pp. 90–99, figs. 2*).—Reports of progress are included on studies of the genetics, physiology, and pathology of cotton, with special reference to wilt and the breeding of wilt-resistant varieties, by V. H. Young, L. M. Humphrey, W. H. Tharp, and E. M. Cralley (coop. U. S. D. A.); physiology and pathology of biological strains of the cotton-wilt fungi, by Cralley; the etiology and control of seedling blights and boll rots of cotton, and strawberry diseases (*Mycosphaerella fragariae*(?) fruit spot, "Blackmore variegation," and spray tests), both by Young; biology and control of crown rust and winter injury of oats, by H. R. Rosen, L. M. Weetman, and C. K. McClelland; life history of crown rust of oats, by Rosen and Weetman; control of diseases of garden roses, particularly black spot, by Rosen; and stem rot (*Sclerotium oryzae*) and seedling blights of rice, by Cralley.

[Plant disease studies by the Colorado Station] (*Colorado Sta. Rpt. 1938, pp. 17, 18*).—Summaries of progress are given on diseases of greenhouse crops (*Fusarium* rot of carnations, and *Thielavia* black rot of sweet peas); onion root rots due to *Fusarium* spp., and *Phoma* disease of seedlings; *Pythium butleri* taproot rot of beets; *Phytophthora capsici* blight of peppers; a new potato disease due probably to bacteria; and peach mosaic.

[Plant disease work by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1937–38, pp. 100–104*).—Progress is briefly summarized concerning milo disease control by resistant varieties, kernel smuts of sorghum, wheat bunt in relation to winter hardiness, resistance and environal factors in take-all foot rot of wheat, resistance to wheat flag smut, physiologic races of and resistance to oat smut, alfalfa diseases, and cereal disease and uniform bunt nurseries, all by L. E. Melchers; potato *Rhizoctonia* control, black raspberry anthracnose control, and mosaic-resistant cucumber breeding, all by O. H. Elmer; and the reaction of varieties, selections, and hybrids of winter wheats to leaf rust in the rust nursery, physiologic specialization in this rust, overwintering and epidemiology of leaf rust in Kansas, and the effects of leaf rust infection on yield, kernel weight, and protein content of winter wheat, all by C. O. Johnston.

[Phytopathology studies by the Maryland Station] (*Maryland Sta. Rpt. 1938, pp. 47–55*).—Progress reports are given on work with the production of strains and varieties of economic plants resistant to diseases, including *Fusarium* wilt-resistant tobacco; pea root rots; tobacco diseases, particularly wildfire and downy mildew; apple scab and spray injury; potato seed improvement and disease control; disease resistance in potatoes, with special reference to vascular discoloration, late blight, scab, and other serious troubles; strawberry root diseases, particularly the *Fusarium* black root rot, and the *Phytophthora* red stele root rot; disease resistance in peas, with special reference to *Fusarium* wilt, *Aphanomyces* root rot, powdery mildew, *Mycosphaerella* blight, and unfavorable climatic conditions; the physiology of plant viruses, especially those of potato and tobacco; the cytology of some pathological responses induced by certain chemicals; and the life history of *Caryospora putaminum* from old peach stones and its possible relation to disease.

[Plant disease studies by the Michigan Station] (*Michigan Sta.* [*Bien.*] *Rpt., 1937–38, p. 13*).—Brief reports are included on work with fungicides for potato foliage and wilt resistance of tomatoes.

Plant pathology (*West Virginia Sta. Bul. 290* (*1938*), *pp. 31–35*).—Brief reports of progress are included on studies of black root rot of apple trees (*Xylaria mali*), by F. D. Fromme and F. J. Schneiderhan; *Fusarium* wilt of watermelons; the factors in spray injury to apple trees, by Schneiderhan and C. F. Taylor; blue stem disease of potato, by L. M. Hill and C. R. Orton; search for a blight-resistant American chestnut; and growth-promoting substances and other factors in the behavior of fungi, by H. Cameron, L. H. Leonian, and V. G. Lilly.

The taxonomy and nomenclature of the phytopathogenic bacteria, W. H. Burkholder. (Cornell Univ.). (*Phytopathology, 29* (*1939*), *No. 2, pp. 128–136*).—In explaining the treatment of phytopathogenic bacteria in the forthcoming edition (fifth) of Bergey's Manual of Determinative Bacteriology (E. S. R., 71, p. 28), it is considered that the generic characters of possession and position of flagella as used alone by various taxonomists do not distribute the plant pathogens into natural groups. However, by employing physiological properties along with a limited number of morphological characters certain generic groups can be pointed out. No new generic names have been given as yet. The genus *Erwinia* is allowed to stand but is placed next to *Escherichia* and *Aerobacter*. *Phytomonas* is divided into three natural groups. *P. campestris* is allocated to the center of one group and *P. syringae* to a second. The latter is considered as related to the genus *Pseudomonas* of Bergey, and *Phytomonas tumefaciens*, together with similar gall formers, to *Bacterium radiobacter* and the genus *Rhizobium*. The wilt producers, such as *Phytomonas michiganensis*, are said to show some relationships to the gall formers. The nonmotile plant pathogens are not deemed to be closely related and are distributed among the above named groups.

A spore isolator combining some of the advantages of the La Rue and Keitt methods, E. B. Lambert. (U. S. D. A.). (*Phytopathology, 29* (*1939*), *No. 2, pp. 212–214, fig. 1*).—An inexpensive "biscuit cutter" type of apparatus is described for isolating single spores from the surface of agar plates.

A simple method of measuring the interfacial friction of dusted seeds, R. F. Suit and J. G. Horsfall. (N. Y. State Expt. Sta.). (*Phytopathology, 29* (*1939*), *No. 2, pp. 200–204*).—In the method described a plunger is thrust into a beaker full of seeds sitting on a spring platform scales. The interfacial friction is measured in pounds by the indicator needle on the scales. Red copper oxide, 2 percent Ceresan, New Improved Ceresan, copper carbonate, Semesan, zinc oxide, and talc were found to increase the interfacial friction. Flake graphite proved more efficient in reducing this friction than amorphous graphite of equal particle size. The reliability of the method is indicated by the fact that these results agreed with field observations and reports by other workers.

Studies of Solanum virus 4, R. W. G. Dennis (*Phytopathology, 29 (1939), No. 2, pp. 168–177, fig. 1*).—*Solanum* virus 4 was freed from contamination with *Solanum* virus 1 by passage through potato variety U. S. D. A. 41956, and its reactions, other than on potato, were studied on 18 hosts. Physical properties of the purified virus proved to be almost identical with those of *Solanum* virus 1, from which the virus may be distinguished by its reaction on *Datura*, tomato, and on certain potato varieties. Infection with either virus failed to protect a plant against reinfection with the other.

New species of Taphrina and new records from western North America, A. J. Mix (*Amer. Jour. Bot., 26 (1939), No. 1, pp. 44–48, figs. 2*).—Interesting new records of *Taphrina* on native western hosts are reported including three species here newly described, *T. amelanchieri* on *Amelanchier alnifolia*, *T. boycei* on *Betula fontinalis* and *B. occidentalis*, and *T. flectans* on *Prunus emarginata*.

The Ustilaginales of South Africa, G. L. I. Zundel. (Pa. State Col.). (*Bothalia, 3 (1938), No. 3, pp. 283–330*).—This paper "is an attempt to monograph partially the smuts or Ustilaginales of South Africa and adjacent territories," including South-West Africa, Portuguese East Africa, Tanganyika Territory, Rhodesia, and Nyasaland Protectorate. An introductory characterization of the group and its classification is followed by a key to the genera and presentation of the individual species. Indexes of hosts and of genera, species, and synonyms are provided.

Chevron, a barley variety resistant to stem rust and other diseases, R. G. Shands. (U. S. D. A. and Univ. Wis.). (*Phytopathology, 29 (1939), No. 2, pp. 209–211*).—The original seed lot from which Chevron C. I. 1111 was selected (Chico, Calif., 1918) was obtained in 1914 from Switzerland. It is a variety of *Hordeum vulgare pallidum* with spring growth habit which proved resistant to a natural epidemic of stem rust (*Puccinia graminis*) in 1937 and had previously shown resistance in a light epidemic in 1935. Crosses and backcrosses indicated its rust resistance to be governed by a single factor. This barley has a fairly stiff straw and is also resistant to scab (*Gibberella saubinetii*). Other workers have shown its resistance to powdery mildew (*Erysiphe graminis hordei*) and stripe (*Helminthosporium gramineum*), but it has proved susceptible to leaf rust and the sporidium-forming smuts of barley.

Barberry eradication helps to control black stem rust, E. A. Helgeson. (Coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul., 1 (1938), No. 2, pp. 3, 4, figs. 2*).—This is a brief general discussion of the cereal rust situation in the State and of the barberry eradication campaign.

Progress report of the Dominion botanist for the years 1935 to 1937 inclusive, H. T. Güssow (*Canada Expt. Farms. Div. Bot. Rpt., 1935–37, pp. 100, fig. 1*).—As in previous reports (E. S. R., 74, p. 497), these pages contain summaries of results on investigations of diseases of various cereals, forage crops, ornamental plants, forest trees, orchard fruits, potatoes, and vegetable and miscellaneous crop plants. Miscellaneous mycological studies are also briefly reported upon.

The diseases of truck crops in Hawaii, G. K. Parris. (Hawaii Expt. Sta.). (*Hawaii Univ., Agr. Ext. Bul. 33 (1938), pp. 78, figs. 42*).—This handbook includes general information on the nature of plant diseases, their economic importance in Hawaii, and materials and methods used in their control, and then takes up in more detail the diseases of specific crop plants (asparagus, bean, beet, cabbage, carrot, celery, corn, crucifer, cucurbit, eggplant, lettuce, okra, onion, pea, pepper, potato, spinach, and tomato.

Internal black spot of garden beet, J. C. Walker. (Univ. Wis.). (*Phytopathology, 29 (1939), No. 2, pp. 120–128, figs. 4*).—The symptoms of this disease, said to have become extremely important to the canning industry, are very distinctive on the roots and tops and have much in common with the boron-deficiency disease in sugar beets long known as heart rot. The preliminary results here presented appear to indicate that no pathogenic agent is involved as a primary cause, and surveys in Wisconsin indicated the disease to be prevalent under a wide variety of soil conditions, but that the majority were alkaline. Limited trials (1937) with borax applications indicated some beneficial results, and these, in connection with trials reported in New York by Hartman (E. S. R., 80, p. 58), would suggest further study of the possible causal relation of a deficiency in minor elements to the development of this trouble.

Use of boron in controlling canker of table beets, W. L. Powers and A. G. B. Bouquet (*Oregon Sta. Circ. Inform. 195* (*1939*), *pp. 6, pls. 2*).—Canker in this important Oregon root crop has been known for several years, injury in extreme cases ranging up to complete loss in marketable beets. In greenhouse tests canker developed in untreated beets, was not prevented by potash and was even increased by lime or high potash, while as little as 10 lb. of boric acid per acre prevented it and gave striking increases in yields. Similar trends were indicated in field trials, while various other minor elements tried proved ineffective. The availability of boron in the soil varied with its geological origin, colloidality, reaction, moisture content, and possibly with soil temperature.

Celery stem crack and the use of boron in its control, A. G. B. Bouquet and W. L. Powers (*Oregon Sta. Circ. Inform. 194* (*1939*), *pp. 4, pl. 1*).—Celery stem crack was first reported in Florida in 1924, and its presence in Oregon was noted about 1935, followed by a larger number of complaints in 1936–37. In control trials at Corvallis, 32–50 percent of the untreated control plants were affected, while in those in rows treated at the rate of 20 lb. of borax per acre the number affected was reduced to 0–9.5 percent. Other tests reported showed similarly satisfactory trends. Methods of applying borax are discussed.

Host-parasite interactions with bacterial wilt of maize, R. E. Lincoln. (Iowa Expt. Sta.). (*Science, 89* (*1939*), *No. 2303, pp. 159, 160, fig. 1*).—Using a mixture of virulent and avirulent strains of *Phytomonas stewartii*, on passage through the susceptible host there was a differential selection for the avirulent type. Changes in the proportions of the virulent and avirulent strains proceeded in orderly fashion from the time of inoculation to the death of the host, the direction of the change depending on the host. Virulent bacteria killed the susceptible host in 10–15 days but only stunted the resistant host, while avirulent bacteria stunted but did not kill the susceptible host and became limited to the first early lesions in the resistant host. Assuming as a working theory that the most advantageous host-parasite relation is one of equilibrium, this point is reached in the low virulence of bacteria adapted to the susceptible host and in the high virulence in the resistant maize.

Blue stain of cotton caused by fungi, O. P. Owen (*North Carolina Sta. Tech. Bul. 59* (*1938*), *pp. 12, figs. 2*).—The nature and importance to producers and manufacturers of spots and stains in cotton fiber are discussed, and it is indicated that losses from blue stain are economically substantial. At least one fungus, *Alternaria* sp., proved capable of causing blue stain. Immature fibers were more readily attacked, and infection was found to occur during and soon after the opening of the bolls. This fungus causes the blue stain in baled cotton under various storage conditions. It is not parasitic on seedlings or more mature plants. The fiber staining was much greater during periods of high rainfall and excessive moisture. The evidence appears to indicate that much of the damage can be avoided by harvesting soon after the bolls open and storing under dry conditions.

Freezing injury to canning peas, J. C. Walker. (Univ. Wis.). (*Phytopathology, 29 (1939), No. 2, pp. 188–194, figs. 5*).—Damage to canning peas by late spring frosts is said to be often more serious than is superficially evident, due to the fact that plants are rarely killed and recover rapidly. The delayed maturity induced in a portion of the plants seriously reduces the yield at the prime canning stage, and the unevenness of growth is a limiting factor for satisfactory seed production. The responses of buds, leaves, sepals, and stems to freezing injury are of interest both because they illustrate the varied reactions of growing organs to this sudden differential damage to the cells, and because they furnish diagnostic symptoms of this trouble that prove very useful in detecting and estimating frost injury and in distinguishing it from other maladies.

Adjusting pH reactions of soils with sulfur and limestone to control brown rot of potatoes, A. H. Eddins. (Fla. Expt. Sta.). (*Amer. Potato Jour., 16 (1939), No. 1, pp. 6–16, fig. 1*).—This reports a continuation of previous work (E. S. R., 76, p. 346), and consists of field tests. A single sulfur-limestone treatment controlled brown rot for 4 yr. in Scranton fine sand and for 3 yr. in Bladen fine sandy loam, 800 lb. of sulfur to the acre being applied in summer followed by 3,000 lb. of limestone in the fall. Unsatisfactory control and low yield followed treatment with 800 lb. of sulfur in the preceding November, a lethal reaction not being produced in this soil until April. On the other hand, disease control and normal yield occurred with similar sulfur treatment in June followed by 3,000 lb. of limestone in November. The pH readings for many soil samples at different seasons in the Hastings, Fla., area are given. Inoculated and commercial sulfur used at the same rates produced approximately the same changes in soil reaction, and tests indicated that each 100 lb. changed it ±pH 0.15 when used at the 400-lb. rate and pH 0.2 when used at rates of 500, 600, and 800 lb. to the acre. Amounts of sulfur are recommended for treating four types of sandy soils testing pH 4.4–6.4 to adjust them to pH 4 or lower for control of brown rot. Equal amounts of calcium and dolomitic limestone when applied to sulfured soils produced approximately the same changes in reaction. Applications of 3,000 lb. of limestone per acre to soils which had been reduced to pH 3.8–3.9 had even greater yield increases in healthy potatoes than lighter applications.

The influence of acid-forming and non-acid-forming fertilizer on the development of potato scab, H. T. Cook and T. J. Nugent. (Va. Truck Expt. Sta.). (*Amer. Potato Jour., 16 (1939), No. 1, pp. 1–5*).—The soil reaction data for small areas of Sassafras sandy loam corresponding to each of 58 potato samples indicated that in 1938 scab failed to develop at pH 4.8 or lower with either acid- or non-acid-forming fertilizers, but that it increased progressively in both amount and severity with decreasing acidity. There was no correlation between scab infection and kind of fertilizer. It is concluded that the occurrence and severity are correlated with soil reaction, and that they are influenced by fertilizer type only to the extent that the soil reaction is thereby changed. Since scab is able to develop at pH 4.85–5 but not at more acid reactions, it is deemed advisable in the future to recommend soil treatment adjusting the reaction to ±4.8 instead of 5, and then to use non-acid-forming fertilizers to avoid making the soil more acid. Data from a liming test indicated very little yield differences at soil reactions between pH 4.8 and 5.

Pathogenic races of Actinomyces scabies in relation to scab resistance, J. G. Leach, P. Decker, and H. Becker. (Minn. Expt. Sta.). (*Phytopathology,* *29 (1939), No. 2, pp. 204–209, figs. 4)*.—Reporting the occurrence of two pathogenic races of *A. scabies*, the susceptibility of potato seedlings, previously reported as resistant, is explained on the basis of racial differences in the pathogen. The significance of this factor in the problem of breeding for resistance and in studying the nature of resistance is discussed.

Charcoal rot of sugar beet, C. M. TOMPKINS (*Hilgardia [California Sta.], 12 (1938), No. 1, pp. 73–81, figs. 4*).—A crown rot of sugar beet occurring only in the interior valleys of California and apparently dependent on high temperatures is described as due to *Macrophomina phaseoli*. Laboratory inoculations with different isolates of the sclerotial form from spontaneous infection were successful in sugar beet roots and seedlings, and infection of the roots was also obtained with isolates from other hosts. The optimum growth temperature of one of the strains from sugar beet was ±31° C.

[Disease and weed control in tobacco seedbeds] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1938, pp. 130, 131*).—A note on sterilization of the soil to facilitate control of weeds and diseases in seedbeds by the use of a stationary steam boiler with permanent buried tile system.

Status of investigations of tobacco downy mildew, F. A. WOLF (*Phytopathology, 29 (1939), No. 2, pp. 194–200*).—The author discusses the present status of knowledge regarding the endemism of *Peronospora tabacina*, sources of inoculum, sporangial dissemination, and the relation of weather to the disease. The lack of essential information with respect to the oospore stage and the possible resistance of recovered seedlings is indicated. Although benzol vapor provides a means of control, it is concluded that fundamental problems relative to its use remain unsolved.

Laboratory studies on toxicity of benzol vapors to tobacco seedlings and to Peronospora tabacina, J. A. PINCKARD, F. A. WOLF, R. MCLEAN, F. R. DARKIS, and P. M. GROSS. (Va. Expt. Sta. et al.). (*Phytopathology, 29 (1939), No. 2, pp. 177–187, figs. 3*).—Using apparatus designed for benzol treatment, attempts were made by laboratory methods to determine the minimal concentrations of the vapor in air that are injurious to tobacco seedlings and the concentrations toxic to the fungus. A combustion method of analysis adapted for determination of benzol in benzol-air mixtures was devised and is described. Among the several factors apparently involved in determining the toxicity limits are duration of exposure, number of applications, and presence of visible moisture on the foliage. At atmospheric pressure, benzol vapor concentrations greater than ±2 percent by volume proved injurious to tobacco seedlings if the foliage was wet during the period of medication, and those greater than 3 percent if there was no visible moisture. Concentrations of ±0.5 percent by volume or greater were lethal to the fungus sporangia, and repeated exposure of infected seedlings to less than 0.5 percent inhibited sporulation. Lower concentrations were required to cause injury at pressures below atmospheric pressures. It is suggested that the mechanism of its toxic action to plants or animals involves (1) absorption by the cell walls and (2) dissolution of lipoidal materials in the plasma membrane with consequent adverse modification of permeability and correlated functions.

Field studies on concentration of benzol vapors as used to control downy mildew of tobacco, F. A. WOLF, J. A. PINCKARD, F. R. DARKIS, R. MCLEAN, and P. M. GROSS. (Va. Expt. Sta. et al.). (*Phytopathology, 29 (1939), No. 2, pp. 103–120, figs. 7*).—These studies are said to confirm previous results (E. S. R., 78, p. 648) in showing the successful use of benzol vapors. Downy mildew was completely prevented by fumigation prior to an outbreak and continued throughout an epidemic, while if begun after the outbreak further progress was checked. Since the limits of toxicity of benzol to the parasite v. the host are widely separated there is very little danger of injury to seedlings under field conditions. Using a Mine Safety Appliance Combustible Gas Indicator, it was determined that the volume-percentages of vapors in the seedbed atmosphere toxic to the pathogen and of those injurious to seedlings agree closely with the values previously established in the laboratory. Among the factors influencing effectiveness as measured by vapor concentration are the amount of benzol used per unit area of bed, the ratio of evaporator to seedbed areas, the porosity and penetrability of the covers as modified by texture and by rain or dew thereon, the rate of volatilization as modified by temperature and as retarded by mixing lubricating oil with the benzol, and the presence of water on the seedling foliage. Moisture on the covers is said to be the most essential condition for effectiveness. Although the effective vapor concentrations in the seedbed atmosphere are known, the effective concentrations in the free water on the leaves and in the cell constituents remain to be determined. The effective concentrations in water in these situations during fumigation are indicated to be above those in the seedbed atmosphere.

Paradichlorbenzol, an eradicant fungicide, effective against downy mildew of tobacco, J. A. Pinckard and R. McLean. (Va. Expt. Sta. et al.). (*Phytopathology, 29 (1939), No. 2, pp. 216–219, figs. 3*).—Tobacco seedlings spontaneously infected with *Peronospora tabacina* were fumigated with paradichlorobenzol vapors for 12-hr. periods at night. Seedbeds used were 4 sq. yd. in area and covered by cotton sheeting with a warp and woof of 64 threads per inch and a weight of 1 lb. per 2.68 sq. yd. Nightly applications of 28 g of paradichlorobenzol placed above the plants on net evaporators (18 in. square) proved to be fungistatic. Eradicant fungicidal vapor concentrations were obtained with single applications of 112 g of fumigant. By increasing the area of the net evaporators to equal that of the seedbeds, 225 g of paradichlorobenzol was fungicidal, although phytocidal concentrations were here approached. Using waterproof seedbed covers and net evaporators of like area, phytocidal concentrations were obtained with 453 g of fumigant. Maximum fumigation temperatures were less than 75° F.

Aggregation of purified tobacco mosaic virus, H. S. Loring, M. A. Lauffer, and W. M. Stanley (*Nature [London], 142 (1938), No. 3601, pp. 841, 842*).—The results of the three types of experiments reported failed to show an appreciable irreversible aggregation due to centrifugation, and it was indicated that the size and shape of the particles of purified virus are similar to those in the juice. Preparations obtained in the cold by rapid chemical treatment or preferably by ultracentrifugation appeared to be the only ones yet obtained that are comparable to the virus in untreated juice as regards specific activity, filtrability, and stream double refraction.

The diffusion of tobacco mosaic virus protein in aqueous solution, H. Neurath and A. M. Saum. (Cornell Univ.). (*Jour. Biol. Chem., 126 (1938), No. 2, pp. 435–442, figs. 2*).—Diffusion measurements of this virus protein, prepared by Stanley's chemical method and dissolved in 0.1 M phosphate buffer, were made by Lamm's refractometric method, the observed diffusion constant being $\pm 3\times 10^{-8}$ cm^2 per second in the most dilute solutions. The average molecular weights calculated from this value and the sedimentation constants were ±64,800,000 for the heavier component and ±59,000,000 for the normal component. The ratio of the axes computed from these values was ±1:55.

The Chilean tomato, Lycopersicon chilense, as a possible source of disease resistance, F. O. Holmes (*Phytopathology, 29 (1939), No. 2, pp. 215, 216, fig. 1*).—Though long known to botanists, the Chilean tomato has not previously become available to horticulturists interested in disease resistance, but the species and a hybrid with the common tomato are now in hand. The hybrid is in many respects intermediate, but is characterized by a finer cutting of the leaves than in the garden tomato and by conspicuous stipules and floral bracts.

Bordeaux injury to tomatoes and its effect on ripening, J. G. Horsfall, R. O. Magie, and R. F. Suit (*New York State Sta. Tech. Bul. 251 (1938), pp. 39, figs. 16*).—The results of a nine-season field and greenhouse study in which the growth, blossoming, and fruiting of tomatoes sprayed with varying bordeaux mixtures, lime alone, and copper materials without lime were measured indicated that bordeaux did not lengthen nor did artificial defoliation shorten the time from anthesis to ripening. Bordeaux did, however, dwarf the plants, kill the meristems, deform young leaves and fruits, and induce defloration. These effects became evident through a reduced final yield, which in turn caused the harvest curve to be flatter for sprayed than for control plants. Bordeaux also hardened the foliage, accelerated transpiration, decreased the growth cracks, occasionally induced fruit russet, and increased the tendency of the pedicel to adhere to the fruit, but it had little or no effect on blossom-end rot.

Hardening of the foliage was apparently of two types, one probably induced by copper and the other by calcium. Curtailment of blooming seemed to be related to dwarfing. Defloration is believed to have resulted from (1) copper toxicity, (2) accelerated transpiration, and (3) calcium hardening. Much of the bordeaux injury (e. g., dwarfing, heightened transpiration, and defloration) was apparently related directly or indirectly to alkalinity. Similar injury was sometimes induced by acid, but not by neutral sprays. With blight present, frost killed more green fruits on sprayed than on unsprayed plants because the disease prevented the continued setting of fruit on the untreated plants.

Studies on fire-blight ooze, E. M. Hildebrand (*Phytopathology, 29 (1939), No. 2, pp. 142–156, figs. 4*).—These studies indicated bacterial survival for 2 yr. or longer in the dried natural matrix, but for only 2 weeks in the moist exudate. Ooze produced by inoculating green pear fruits aseptically was at first turbid but cleared with age. This clearing was correlated with rapid death, probably due to some deleterious substance active under moist conditions. Prompt and rapid drying proved necessary for more than 2 weeks' survival in the natural matrix. The ooze was cinnamon rufous brown, according to Ridgway's scale (E. S. R., 29, p. 762). Analyses indicated that a sugar identified as dextrose comprises 31 percent of the dry matter of the ooze. The effect of prompt and rapid drying of the ooze on the bacterial viability was experimentally demonstrated. Only the ooze collected at 7 days (the shortest interval) after inoculation survived more than 2 weeks. Similar effects on viability were noted when the pathogen, after culture on agar, was subjected to the action of the sterile exudate matrix.

Bacteria in the ooze were more sensitive to heat and bactericides than when artificially cultured. Added to synthetic media, the diluted sterile matrix was utilized as a source of carbon. When embedded in their natural matrix the bacteria stained unevenly, the dye taking effect chiefly at the poles. They seem to be surrounded by a sheath removable by centrifuging. Diluted ooze with an osmotic pressure of 1.61 atmospheres produced wilting of pear shoots and cell plasmolysis, whereas with pure sucrose solutions osmotic pressures of 15 atm. or over were required to produce the same results. Succulent pear shoots wilted when immersed either in ooze or in sterile ooze matrix from which the bacteria had been removed, indicating the presence of a toxin, the exact nature of which remains to be determined.

Control of fire blight of apples and pears, H. R. Rosen (*Ark. Agr. Col. Ext. Circ. 408 (1938), pp. 14, figs. 6*).—This semipopular account on fire blight discusses the identification of the disease, the relations of cultural treatments and fertilizers to it, the way in which the bacteria get into the trees, and control by spraying, pruning, and use of resistant varieties.

Differential reaction of apple varieties to Gymnosporangium juniperi-virginianae, G. L. McNew (*Iowa Sta. Res. Bul. 245 (1938), pp. 113–142, figs. 6*).—Most of the collections of *G. juniperi-virginianae* from seven States and different localities in Iowa produced aecidia on Bechtel Crab, Wealthy, Jonathan, and Rome Beauty, flecks with or without spermogonia on York Imperial, Tolman, Ben Davis, Maiden Blush, Oldenburg, Turley, and Grimes Golden, and flecks on Delicious and Northwestern Greening. These collections were classified into eight groups on the basis of differential reactions on certain varieties, four of which were considered as possible parasitic races with following differential reactions: The first one produced aecidia on Tolman and York Imperial, the second caused a diffuse spreading fleck on York Imperial and defoliation of Jonathan after large aecidial sori had been produced, the third failed to infect Delicious and Northwestern Greening, and the fourth defoliated Turley after producing spermogonia.

Some of these differential reactions were correlated with degree of mycelial development in the leaf tissues. All collections studied (possibly excepting the noninvasive race on Delicious and Northwestern Greening) penetrated the epidermis and became inter- and intracellular in the palisade layer. The hyphae from collections causing punctiform flecks on Ben Davis and Turley had collapsed and were surrounded by injured palisade-parenchyma cells. The hyphae of collections causing large diffuse flecks on these varieties became established in the spongy parenchyma, even though the palisade layer was injured. The collections producing spermogonia in diffuse flecks on Ben Davis caused pronounced hypertrophy of cells in the spongy parenchyma. The hypertrophied cells in contact with the spermogonia collapsed before their maturation. The mesophyll cells underwent hypertrophy and hyperplasia before spermogonia were formed in all varieties except Maiden Blush, in which case the mycelium developed in the palisade layer and produced spermogonial initials, though cells of the spongy parenchyma appeared sensitive to the haustoria.

Phomopsis twig blight of blueberry, M. S. Wilcox. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 2, pp. 136–142, figs. 2*).—A minor twig blight of *Vaccinium corymbosum* has been reported as of sparing occurrence in commercial blueberry sections of Massachusetts, New Jersey, and North Carolina. The author here demonstrates the pathogenicity of the causal fungus and its apparent identity with *P. vaccinii* from decayed cranberry fruits. Young succulent blueberry shoots were blighted by both fungus strains, regardless of the method of inoculation. Localized lesions were formed on woody tissue, and occasional leaf-spotting occurred.

Raspberry diseases in the season of 1938, C. J. Eide. (Univ. Minn.). (*Minn. Hort., 66 (1938), No. 11, p. 209*).—Anthracnose and winter injury are reported as having been especially prevalent, and are briefly discussed.

Leaf-scar infection in relation to the olive-knot disease, W. B. Hewitt (*Hilgardia* [*California Sta.*], *12 (1938), No. 1, pp. 39–71, pls. 5, figs. 6*).—It was found that spontaneous infection with *Bacterium* (*Phytomonas*) *savastanoi* in the abscission-zone region rarely occurs before leaf fall, and the evidence obtained confirmed the conclusions of others that most of the new knots forming each year develop at leaf scars. Most of the scars were susceptible to infection immediately after leaf fall, the susceptibility dropped rapidly during the first day, and by the end of the ninth they became immune. This lowering of susceptibility was much more rapid in damp chambers than outside.

Microchemical studies of the abscission processes and the healing of leaf scars indicated that (1) no protective layers are formed in the tissues before leaf fall, (2) separation occurs through the intercellular material between two rows of cells in the base of the abscission zone, (3) the sieve tubes, vessels, cuticle, fibers, and apparently the epidermal cells also are mechanically broken at leaf fall, (4) during the healing of the leaf scar a wound-gum layer is first formed, followed by development of a periderm, and (5) water-soluble gums, lignin, oil, suberin, starch, and tannins appear to have no influence on infection. Indian ink tracing of the course of the inoculum from the leaf scar surface into the scar tissues appeared to indicate that infection may depend on the depth of its penetration. Most infections in the leaf scars were due to bacteria entering the tissues through vessels. Those entering through intercellular spaces progressed slowly and were stopped by wound gum plugging these spaces. Those entering the vessels were freed into the periderm cells when the vessels were slowly pulled apart by periderm growth. Bacterial pockets were formed in the tissues derived from the phellogen, and the largest amount of cell proliferation occurred around these pockets.

Literature of the tropical crop plants and their diseases and pests [trans. title], edited by H. A. Kuntze (*Mitt. Biol. Reichsanst. Land. u. Forstw., No. 56 (1938), pp. 32*).—Part 1 gives an annotated list of general reference works, works on tropical agriculture, diseases and pests, gardening, and miscellaneous data, while part 2 includes a similar list of special literature on specific crop plants.

The toxic effect of certain chemical solutions on spores of Penicillium italicum and P. digitatum, L. Hwang and L. J. Klotz (*Hilgardia [California Sta.], 12 (1938), No. 1, pp. 1–38, figs. 5*).—It was shown that a 0.25 percent solution of a nontoxic soap wets and prepares spores of these two common molds of citrus fruits for subsequent chemical treatment, without decrease in germinability. Using the methods described, distilled water at 120° F. for 5 min. killed ±90 percent of the spores. Tests with borax, Na_2CO_3, and Metbor indicated that the longer the exposure to and the higher the temperature and the greater the concentration of the chemicals, the more effective were the solutions in reducing viability. As tested, the toxicity of the 11 chemicals used to the spores depended more on temperature than on concentration or immersion time. A 5-min. exposure at 120° in a 6 percent borax-boric acid mixture, 6 percent Metbor, 0.4 percent chloramine-T, or 6 percent Na_2CO_3 proved lethal, while saturated dinitro-*o*-cyclohexylphenol or 1 percent of a proprietary washing powder at room temperature for 2 and 5 min., respectively, only slightly inhibited germination. Exposure for 5 min. to 6 percent $NaHCO_3$ at 86°, 100° 110°, and 120° showed no advantage over water, and at 86° immersion in 10 percent for 5 min. or in 6 percent for 10 min. had but little effect on the spores. Exposure for 2 min. at 69° to 0.4 percent sodium hypochlorite proved lethal to the spores of both fungi. The three next most efficacious solutions, used at 100° and below for 5 min., were 6 percent Na_2CO_3, 0.15 percent sodium-*o*-phenylphenate, and 6 percent borax, but these were far less effective than sodium hypochlorite. At 110° and 120° the most toxic of six tested were 0.4 percent chloramine-T, 6 percent Na_2CO_3 and the 6 percent mixture (2:1) of borax and boric acid.

Structural and microchemical changes in granulated orange vesicles, F. M. Turrell and E. T. Bartholomew. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 24 (1939), No. 3, pp. 88, 110, figs. 7*).—It was found that during granulation the juice vesicle becomes hardened, enlarged, colorless, and highly refractive, and that eventually it collapses. Hardening is due largely to gelatin of the cell sap accompanied by thickening of the cell walls of the internal cells, and transformation of the normal pectocellulose wall to harder substances of hemicellulose or ligninlike composition. Enlargement is due to increments in structural material, addition of water, and enlargement of the internal cells, lack of color to carotene loss, and refractiveness to gas bubbles in the interior cells and formation of a gas-filled cavity. Collapse of the vesicles is due to softening of the cell walls and break-down of the internal cellular structure of the vesicle.

Water damage to a citrus relative, Fortunella margarita, L. J. Klotz. (Calif. Citrus Expt. Sta.). (*Phytopathology, 29 (1939), No. 2, pp. 214, 215, fig. 1*).—The first evidences of spontaneous damage noted in the kumquat were microscopic cracks later enlarging so as to extend from stylar to calyx ends, and the same type of injury was reproduced in a rain chamber. Sap expressed from the rind and whole fruit of kumquat and from Washington Navel orange had more sugars and higher osmotic pressure values in the former than in the latter, and the rind sap of kumquat also had more pectin.

Thyronectria denigrata (Winter) Seaver, the cause of disease in Gleditsia, E. V. Seeler, Jr. (*Jour. Arnold Arboretum, 20 (1939), No. 1, pp. 114, 115*).—This is a note on two new diseases, one a wilt of *G. japonica* due to *T. denigrata*—previously recognized only as a saprophyte, and the other a canker of *G. triacanthos* apparently due to the same fungus.

Correlation between self-breaking and blue nuclei among certain commercial tulip varieties, F. P. McWhorter. (Oreg. Expt. Sta.). (*Science, 88 (1938), No. 2287, p. 411*).—All dark red varieties of the new tulip race Mendel, out of 49 studied, were found to have a blue pigment in some of the epidermal cells of the flower like that present in La Tulipe Noire and also in red Darwin tulips, all of which varieties, as far as tested, exhibit the peculiarity of darkening (selfing) when inoculated with tulip virus 1, the color-removing virus. The blue pigment, which reacts to changes in pH like an anthocyanin, may be present within the nuclei, rendering them unusually favorable for study as to their living structure.

Some observations on white pine blister rust in Ontario, A. W. McCallum (*Jour. Forestry, 36 (1938), No. 10, pp. 997, 998*).—This is a brief general discussion of this rust in Ontario, with the observation that a recent survey has shown it to be widespread. While the general lack of reproduction in white pine due to unrestricted logging and destruction of young growth by fire is admitted to be regrettable, it greatly simplifies the problem of rust control. Control measures in relation to Crown and private lands are discussed.

Some economic aspects of white pine blister rust control, J. F. Martin. (U. S. D. A.). (*Jour. Forestry, 36 (1938), No. 10, pp. 986–996, figs. 3*).—The author discusses the considerable importance for watershed protection, erosion prevention, and scenic and recreational purposes of the five native white pines of high altitudes in the Western States, and the high present and future commercial value of the three timber species (*Pinus strobus. P. monticola,* and *P. lambertiana*) occurring in the forested areas of 29 States, each of which is taken up in detail. A most important part of the protection of these valuable assets lies in blister rust control. Although the disease works slowly in the older stands, it kills the younger trees in a short time. It is this that makes the disease so serious, and without its control the white pines cannot be perpetuated. The early efforts to eradicate this rust, the development of control measures, organization of the control program, progress of control work, methods of *Ribes* suppression and the cost of destroying it, the application of control measures, and the results of the control program are each in turn summarized.

Losses from heart rot in two shortleaf and loblolly pine stands, G. H. Hepting and A. D. Chapman. (U. S. D. A.). (*Jour. Forestry, 36 (1938), No. 12, pp. 1193–1201*).—In this study, conducted on the two pine species in a young stand in Arkansas and on shortleaf pine only in an older stand in Texas, it was found that most of the decay was red-heart, *Fomes pini*, entering through branch stubs in most cases. *Polyporus schweinitzii* also caused some cull in the butts, entering largely through fire wounds. The highest percentage of cull was in the Texas shortleaf pine, being ±2 percent from decay and ±3.9 percent from all causes. The financial losses involved included both cull and degrade. The volume loss due to rot for the infected logs in the Arkansas stand was 3.9 percent (lumber tally basis), while the financial loss was 7.9 percent. The volume loss for infected logs in the Texas stand was 7, and the value loss 11.3 percent. The percentage value loss, computed on a total stand basis, considerably exceeded the percentage of cull based on log scale. Thus log scale cull percentage probably frequently underestimates the money loss sustained from decay in southern pine, particularly in the younger stands, since incipient decay, resulting in degrade, is not taken into account.

Relation of incidence of needle disease in loblolly pine plantations to certain physical properties of the soil, E. R. TOOLE (*Jour. Forestry, 37 (1939), No. 1, pp. 13–18*).—In young loblolly pines (*Pinus taeda*) infections seemed to be most severe in the youngest plantations, 2–3 yr. old, but no relationship was found of disease incidence with height growth or the seven physical properties of the soil studied. It is deemed probable that the interaction of other factors of the site on these leaf diseases should be given further consideration. Two pathogens were found largely responsible for the killing and browning of the needles, viz, *Lophodermium pinastri* and *Septoria acicola* the latter being by far the more important. The study is of particular interest because of the new application of statistical methods to calculations of the percentage of infection for each of the 600 trees measured.

The disease caused by Trametes pini (Thore) Fries in white pine (Pinus strobus L.), W. R. HADDOW (*Roy. Canad. Inst., Trans., 22 (1938), pt. 1, pp. 21–80, pl. 1, fig. 1*).—Following a review of the literature (52 references), the disease is interpreted as parasitic and enphytotic and of considerable importance to forestry, studies in several virgin forests in Ontario confirming the belief that it is by far the most destructive heart rot of white pine. Typically, it induces decay at the midsection of the trunk but is also often the primary cause of a common butt rot in old pine called "cavity rot." Detection of infected pines in the woods, of practical importance, is possible largely on the basis of the occurrence of "punk knot" and associated symptoms. Fructifications on living white pine in northern Ontario were rare but were common on dead wood of large dimensions, and in the virgin forest this is the largest source of inoculum. The fungus sporulates periodically, the greatest activity occurring in spring and fall and at surprisingly low temperatures. Infection through small branch stubs near the base of trees proved to be of frequent occurrence, and in this way the cavity rot of old trees originates. Furthermore, very small branchlets only a few millimeters in diameter and only a few years old may also provide favorable infection courts. The killed leader of the current season's growth may ultimately become infected, and instances of infection following weevil injury were noted. Plat studies indicated that white pine may become infected at an early age (at least as early as 20 yr.), and among the various tree classes the dominants showed a higher incidence of infection than the others.

The disease is said to be of peculiar interest on account of its widespread distribution and endemism, and its nonlethal yet destructive character. Various proposals for its control include the substitution of resistant for susceptible species, preservation of natural resistance at a maximum, development of mixed stands, introduction of a short rotation, sanitation fellings and thinnings, close utilization, and disposal of waste. These proposals are reviewed critically, and the "pathological rotation" is discussed.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Wildlife conservation] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1938, pp. 81–85*).—The importance of wildlife in land-use programs, effects of hunting and farming on wildlife range, and the restoration of wildlife and soil are again considered (E. S. R., 74, p. 663).

Federal laws relating to wildlife in Alaska (*U. S. Dept. Agr., Bur. Biol. Survey, Alaska Game Comn. Circ. 16* (*1938*), *pp. 12*).—The Alaska game law as amended June 1938 and other Federal acts relating to wildlife are brought together in this circular.

Wildlife food patches in southern Wisconsin, A. Leopold, E. B. Moore, and L. K. Sowls. (Univ. Wis.). (*Jour. Wildlife Mangt., 3* (*1939*), *No. 1, pp. 60–69*).

Faunal relationships and geographic distribution of mammals in Sonora, Mexico, W. H. Burt (*Mich. Univ., Mus. Zool. Misc. Pub. 39* (*1938*), *pp. 77, pl. 1, figs. 25.*)—Some factors influencing mammalian distribution and faunal relationships and biotic provinces in Sonora based on recent mammals are first considered, followed by an annotated list of mammals and a bibliography of 60 titles.

Sickle cells in the blood of western deer, R. W. Dougherty. (Oreg. Expt. Sta.). (*Jour. Wildlife Mangt., 3* (*1939*), *No. 1, pp. 17, 18*).

Food taken by the eastern skunk (Mephitis m. nigra), with particular reference to birds and bird eggs, H. M. Wight (*Pa. Game News, 9* (*1938*), *No. 3, pp. 12, 13, 30, figs. 4*).—An investigation of the food of *M. mephitis nigra* conducted in Oakland County, Mich., since 1928 is reported.

Birds of the high seas: Albatrosses and petrels, gannets, man-o'-war-birds, and tropic birds, R. C. Murphy (*Natl. Geog. Mag., 74* (*1938*), *No. 2, pp. 226–251, pls. 8, figs. 7*).—This is the seventeenth of the series of articles describing the bird families of the United States and Canada, illustrated by paintings by A. Brooks (E. S. R., 77, p. 809).

Studies of the grit requirements of certain upland game birds, L. J. McCann. (Minn. Expt. Sta. et al.). (*Jour. Wildlife Mangt., 3* (*1939*), *No. 1, pp. 31–41, figs. 3*).

Food determination of the ruffed grouse by analysis of excrement, T. Smyth (*Pa. Acad. Sci. Proc., 10* (*1936*), *pp. 15–18*).—The collection and analysis of excreta of ruffed grouse in New York at intervals throughout the months from January to September has shown that, when opportunity offered, the grouse that were under observation preferred staghorn sumac rather than buds as the staple winter diet, with grapes second. It was found that most seeds appear to be little acted upon by the digestive processes of the grouse, a fact noted by Judd in 1904 (E. S. R., 17, p. 676). It is pointed out that almost the only insects whose remains are recognizable after traversing the alimentary system are those possessing excessively durable chitinous parts, such as beetles, and to a lesser extent, ants, grasshoppers, etc.

Early winter food of ruffed grouse on the George Washington National Forest, A. L. Nelson, T. E. Clarke, and W. W. Bailey (*U. S. Dept. Agr. Circ. 504* (*1938*), *pp. 38, figs. 30*).—In a preliminary economic study to provide a scientific basis for forest game management conducted on the George Washington National Forest of Virginia and West Virginia, 20 plants were found to be outstanding sources of food for ruffed grouse in early winter. "These plants furnished about 85 percent of the contents of 185 stomachs collected, chiefly by hunters, in November and December of 1935 and 1936. Herbaceous plants supplied about a third of the food, shrubs and vines each about a fourth, and trees the remainder. The habitats of these 20 food plants also were studied. The results, in tables and graphs, show that wooded areas with open canopies and with soils sufficiently productive for the growth of mixed stands of shrubs and vine thickets furnish the best feeding grounds. The early winter food plants, which are probably equally useful to grouse throughout the winter, are illustrated in normal winter condition for purposes of identification. This will be of assistance in setting up C. C. C. projects for improving grouse habitats in this and adjacent forests, as the winter appearance of the plants is quite different from their showy appearance in summer."

A study of the distribution and migration of the great horned owls in the Missouri Valley region, M. H. Swenk (*Nebr. Bird. Rev., 5 (1937), No. 4, pp. 79–105, figs. 2*).—This contribution is presented with a three-page list of references to the literature cited.

Winter notes on the short-eared owl, G. O. Hendrickson and C. Swan. (Iowa Expt. Sta., U. S. D. A., et al.). (*Ecology, 19 (1938), No. 4, pp. 584–588, figs. 2*).—These notes relate to the winter food of *Asio flammeus flammeus* observed near Ames, Iowa.

The California woodpecker and I: A study in comparative zoölogy, W. E. Ritter (*Berkeley: Univ. Calif. Press, 1938, pp. XIII+340, [pls. 9], figs. [16]*).—This contribution on *Balanosphyra formicivora bairdi*, known as the California woodpecker, includes a bibliography of four pages.

[Work in zoology and entomology by the Arkansas Station] (*Arkansas Sta. Bul. 368 (1938), pp. 62–67, fig. 1*).—The work of the year reported upon (E. S. R., 79, p. 358) relates to the sugarcane beetle, by W. J. Baerg; codling moth oviposition and temperature and causes of cotton aphid outbreaks, both by D. Isely; grasshopper (the differential grasshopper) investigations, by M. Sanderson; and biologies of rice field mosquitoes (*Psorophora columbiae*, *P. ciliata*, and *P. cyanescens*) and reptiles of Arkansas, both by H. H. Schwardt.

[Contributions on economic insects and rodents and their control] (*Conn. Pomol. Soc. Proc., 46 (1936), pp. 18, 19, 33–54, 55–73; 47 (1937), pp. 14–43, 137–144, figs. 3*).—Contributions presented in 1936 (E. S. R., 76, p. 64) include the following: Insects Injurious to Fruit in 1936—Report of Committee on Injurious Insects, by W. E. Britton et al. (pp. 33–36); Six Years' Experience With Oriental Fruit Moth Parasites, by J. C. Schread and W. T. Brigham (pp. 37–47), and Troublesome Insects of the Orchard, by P. Garman (pp. 55–62) (both Conn. [New Haven] Expt. Sta.); Experiments for Control of Rosy [Apple] Aphis and European Red Mite, by H. N. Worthley (pp. 48–54) (Pa. State Col.); and a general discussion on insect control, conducted by H. A. Rollins (pp. 63–73).

Contributions presented in 1937 include: Results With Lead-Lime and Fish Oil Sprays, by M. P. Zappe (pp. 14–19), and Some Important Apple Insects and Control Investigations in 1937 (pp. 26–31) and Recent Developments in [Oriental] Fruit Moth Control (pp. 36–41), both by P. Garman (all Conn. [New Haven]); Experiences With the Lead-Lime and Fish Oil Spray, by C. B. Young (pp. 20, 21); White Apple Leafhopper Parasites in Relation to Control, by H. M. Steiner (pp. 23–25) (N. Y. State); Injurious Insects for 1937—Report of Committee on Injurious Insects, by W. E. Britton et al. (pp. 32–34); and Report on Mouse Control Work in Connecticut, by R. Isaac and D. A. Spencer (pp. 137–142) (U. S. D. A.).

Summary of twenty-five years of work in the departments of entomology and zoology at the Kansas State College, compiled by J. E. Ackert and R. C. Smith (*Kans. State Col. Bul., 21 (1937), No. 9, pp. 55, figs. 2*).—Part 1 (pp. 7–34) relates to work by the department of entomology, under the direction of G. A.

Dean, and part 2 (pp. 35–55), the department of zoology, under the direction of R. K. Nabours, the bibliographies of whom are included.

[Life work of Lawrence Bruner], M. H. Swenk (*Nebr. Bird Rev., 5 (1937), No. 2, pp. 35–48*).—This contribution on the work of L. Bruner (E. S. R., 76, p. 576) is accompanied by a list of 61 references to the literature cited.

Our insect problems, W. D. Whitcomb. (Mass. State Col.). (*Maine State Pomol. Soc. Ann. Rpt., 1936–38, pp. 26–33*).

Report of the Chief of the Bureau of Entomology and Plant Quarantine, 1938, L. A. Strong (*U. S. Dept. Agr., Bur. Ent. and Plant Quar. Rpt., 1938, pp. 3–15, 16–25, 33–39, 42–70*).—The work of the year (E. S. R., 78, p. 658) with fruit and nut insects included codling moth control by the use of insecticides, parasites, bait traps, and mechanical methods; the pear thrips on prunes; oriental fruit moth control by parasites; peach borer, plum curculio, grape berry moth, pecan nut casebearer, and obscure scale control by insecticides; grape leafhopper reduction by burning areas close to vineyards; hickory shuckworm on pecan; California red scale control by fumigation; control of citrus thrips by sulfur dusting; Japanese beetle control by insecticides and parasites; fruitflies (the melonfly and the Mediterranean fruitfly); and Mexican fruitfly control by traps.

Insects affecting forest and shade trees referred to include the Black Hills beetle, western pine beetle, southern pine beetle, bark beetle predators (*Enoclerus lecontei* Wolc. and *Temnochila virescens* (F.)), forest tent caterpillar, pandora moth, spruce budworm, Prescott scale (*Matsucoccus* sp.), hemlock borer, *Lyctus* powder-post beetles, ambrosia beetles, carpenter ants, insect vectors of the Dutch elm disease, and the gypsy and the brown-tail moth.

Cereal and forage insect investigations dealt with include the white-fringed beetle *Naupactus leucoloma* Boh., grasshoppers, corn earworm, European corn borer, hessian fly, armyworm, alfalfa weevil, potato leafhopper, sugarcane borer, fumigation for stored grain insects, and the Mormon cricket.

Truck crop, garden, berry, tobacco, greenhouse, bulb, and mushroom insects reported upon include wireworms; Mexican bean beetle; pea weevil; pea aphid; corn earworm on lima beans; tomato pinworm; tomato fruitworm (the corn earworm); sweetpotato weevil; European earwig; cabbageworms (the cabbage looper, the imported cabbageworm, and the diamondback moth); the strawberry weevil; raspberry fruitworm; red berry mite *Eriophyes essigi* Hass.; beet leafhopper; tobacco flea beetles (the tobacco flea beetle and the potato flea beetle); tobacco hornworms; the tobacco webworm (the corn root webworm); the cigarette beetle; gladiolus thrips; common red spider and the onion thrips on greenhouse-grown tomato and cucumber plants; bulb nematode; iris thrips; cyclamen mite; greenhouse mealybug (citrus mealybug); and mushroom flies (*Sciara* spp.), mites, and other pests on mushrooms.

Cotton insects mentioned are the bollweevil, cotton flea hopper, certain hemipterous insects, pink bollworm, cotton leaf worm, root aphids (the corn root aphid, *Trifidaphis phaseoli* (Pass.), and *Rhopalosiphum subterraneum* Mason), and the Thurberia weevil.

Data on bees related to resistance to foulbrood, breeding, honey plants, beeswax, nutrition, and the lethal effects of insecticides.

Work with insects affecting man and animals considered included screwworms and other blowflies (*Phormia* spp.), fly sprays, *Neogastrallus librinocens* Fish. in libraries, the American dog tick, and mosquitoes.

Insecticides and related studies under way include fumigation of living plant products with methyl bromide; physiology of insects; testing of insecticides; nicotine fumigation; and chemical investigations on (1) insecticidal plants (tobacco, derris, pyrethrum, etc.) and their constituents, (2) the development of synthetic organic insecticides, (3) the removal of spray residue, (4) the development of inorganic insecticides, (5) fumigants for control of insect pests, (6) accessory materials for use with insecticides, and (7) the determination of the toxicity of new insecticidal compounds to goldfish.

[Insect pest control] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1938, pp. 144–148*).—The progress of control work with important insect pests by the improvement of commonly used insecticides and the development of new ones, the development of strains of certain crop plants that are resistant or tolerant to attack, and increasing the natural enemies of insect pests is described.

[Contributions on economic insects] (*Rev. Ent., 8 (1938), No. 1–2, pp. 44–68, 196–203, figs. 11*).—The following contributions are included: Concerning Brazilian Tingitidae (Hemiptera), III, by C. J. Drake and E. J. Hambleton (pp. 44–68) (Iowa State Col. et al.), and New and Little-Known Neotropical Stratiomyidae (Diptera), by M. T. James (pp. 196–203) (Colo. Expt. Sta.).

[Contributions on economic insects and insect control] (*Northwest Assoc. Hort., Ent., and Plant Path., Corvallis, Oreg., 3 (1937), Abs. Papers, pp. 7–9, 14, 16*).—The following abstracts are included in this mimeographed report: The Canadian Forest Insect Survey, by R. Hopping (p. 7); The Occurrence and Control of a Mealy Bug [*Phenacoccus aceris* Sig.] on Apple in British Columbia, by A. A. Dennys (p. 7); Observations on the Tarnished Plant Bug, by E. P. Venables (pp. 7, 8); Symphylid Injury in Vegetable Gardens, by A. G. B. Bouquet (p. 8) (Oreg. Expt. Sta.); Spittle Bug [*Philaenus spumarius* L.] on Strawberries, by W. D. Edwards (p. 9) (Oreg.); The Codling Moth Problem in Various Apple Growing Regions as Influenced by Moth Activity, by R. L. Webster (p. 14) (Wash.); and Recent Developments in Biological Control in Canada, by G. R. Hopping (p. 16).

[Contributions on insects] (*Ohio Jour. Sci., 38 (1938), No. 6, pp. 267–276, 294, 295, 301–303, 304–315, 316–331, figs. 21*).—Contributions on insects here presented are as follows: The Larval and Pupal Stages of Two Tropical American Butterflies, by H. F. Strohecker (pp. 294, 295); Spiders and Insects Found Associated With Sweet Corn, With Notes on the Food and Habits of Some Species—II, Ephemerida, Lepidoptera, Neuroptera, Odonata, Orthoptera, Thysanoptera, and Trichoptera, by R. T. Everly (pp. 311–315) (E. S. R., 80, p. 512); and The Present Status of Work on the Ecology of Aquatic Insects as Shown by the Work on the Odonata, by C. H. Kennedy (pp. 267–276), New Texan Fulgoridae (Homoptera), by J. S. Caldwell (pp. 304–306), Additions to the Ohio List of Dragonflies (Odonata), by D. J. Borror (pp. 307–310) (E. S. R., 77, p. 511), and The Anatomy and Histology of the Alimentary System of the Harlequin Cabbage Bug (*Murgantia histrionica* (Hahn)) (Hemiptera, Pentatomidae), by C. S. Harris (pp. 316–331) (all Ohio State Univ.).

[Contributions on economic entomology] (*Okla. Acad. Sci. Proc. [Okla. Univ.], 17 (1937), pp. 28–34, 39–41*).—Among these contributions are the following: Biology of *Chrysobothris femorata*, by M. Maxwell and F. A. Fenton (pp. 28, 29); The Insect Record for Oklahoma, 1935–36, by F. A. Fenton (pp. 29–31); The 1936 Grasshopper Outbreak in Oklahoma, by C. F. Stiles, E. E. Scholl, and F. A. Fenton (pp. 32–34); (E. S. R., 78, p. 366); and Anaplasmosis Transmission by *Dermacentor venustus* Male Ticks, by C. E. Sanborn (pp. 39–41).

In the experimental transmission work with anaplasmosis by ticks reported by Sanborn, the males of *D. venustus* were proved to transmit it to two different cows. They were also associated with females as known vectors of anaplasmosis in two additional cows.

[Work in entomology by the Colorado Station] (*Colorado Sta. Rpt. 1938, pp. 23–26*).—A brief report is made of the work of the year (E. S. R., 78, p. 659) with grasshoppers, the Mormon cricket, chrysanthemum gall midge, onion thrips on chrysanthemum, pea aphid on sweet peas, bulb mite on Easter lilies, peach borer, and investigations of the effect of fumigation for pinworm on tomatoes.

[Work in economic entomology by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1937–38, pp. 99, 100, 104–110*).—The work of the biennium reported (E. S. R., 78, p. 72) includes bee investigations and studies of cankerworm emergence, the biology of the redbud leaf roller *Gelechia cercerisella* Cham., and the redbud aphid *Aphis pawneepae* Hottes, both by R. L. Parker; the climatic aspects of current injurious insects, by R. C. Smith; the hessian fly, wheat strawworm, mites, leaf-feeding sawflies, false wireworms, and white grubs (*Phyllophaga crassissima, P. rubiginosa,* and *P. lanceolata*) in wheat, by R. H. Painter and H. R. Bryson; garden webworm, grasshoppers, wireworms, seed-corn maggots, and white grubs in corn, by D. A. Wilbur and Bryson; progress of control work with insects affecting the roots of staple crops, by Bryson, and alfalfa, grasses, and allied plants, by Smith and Wilbur; the biology and control of the strawberry leaf roller and control of the codling moth in northeast Kansas, both by Parker and P. G. Lamerson; and the resistance of wheat to hessian fly, and sorghums, corn, and alfalfa to grasshoppers, by Painter and Parker.

[Work in entomology by the Maryland Station] (*Maryland Sta. Rpt. 1938, pp. 58–61, fig. 1*).—The work of the year (E. S. R., 79, p. 359) reported upon includes studies on the biology and control of the orchid thrips *Physothrips xanthius* Wms., Mexican bean beetle, corn earworm, and pea aphid; a study of the oriental fruit moth on quinces and of its parasitism (coop. U. S. D. A.); tests with insecticides for the control of the rose aphid in apple orchards; and the correlation of factors involved in spray injury with insect disease control and physiological effects.

[Report of work in entomology by the Michigan Station] (*Michigan Sta. [Bien.] Rpt. 1937–38, p. 21*).—Brief reference is made to the work of the biennium (E. S. R., 76, p. 655), including spraying experiments for control of elm scale and control of the oriental fruit moth by parasites.

Montana insect pests for 1937 and 1938, H. B. Mills (*Montana Sta. Bul. 366 (1939), pp. 32, figs. 11*).—This biennial report (E. S. R., 77, p. 66) deals with control work in Montana in 1937–38, particularly as it relates to grasshoppers and Mormon cricket. Then follows an account of other important insects of the years, including the pale western cutworm, armyworm, Say's stinkbug, sugar-beet webworm, striped cucumber beetle, codling moth, potato psyllid *Paratrioza cockerelli* Sulc., grass plant bugs (*Labops hesperius* Uhl. and *Conostethus* n. sp.), leaf-folding sawfly *Pontania bozemani* Cooley, Alpine rock crawler *Grylloblatta campodeiformis* Walk., maple twig borer *Proteoteras aesculana* Riley, woolly elm aphid, tomato worm, and little earwig *Labia minor* L.

[Report of work in entomology by the West Virginia Station] (*West Virginia Sta. Bul. 290 (1938), pp. 35–39*).—The work of the biennium 1937–38 briefly referred to (E. S. R., 76, p. 824) includes search for arsenical substitutes for use in the spray program, the timing of sprays and the weather factor in the control of insect pests, control of the codling moth by parasites and predators, and the testing of new insecticides.

[Report of insect outbreaks in Saskatchewan] (*Saskatchewan Dept. Agr. Ann. Rpt., 31 (1936), pp. 98, 136–139, figs. 2*).—An account of damage by the major field crop pests in 1935, by K. M. King, is included (pp. 138, 139).

Report on the entomological division for the year 1936, L. D. CLEARE (*Brit. Guiana Dept. Agr., Div. Rpts., 1936, pp. 83–88*).—In reporting upon the work of the year in entomology in British Guiana (E. S. R., 79, p. 77) particular mention is made of the evident establishment of the tachinid parasite (*Metagonistylum minense* Towns.) of the sugarcane borer in both sugarcane and rice, known as the Amazon fly, throughout the sugar-growing area of the colony. It is pointed out that whatever the final status of the Amazon fly may be it is evident that it cannot be expected to exert any appreciable control of the yellow-headed borer *Diatraea canella.*

Tobacco insects in Cuba [trans. title], S. C. BRUNER and L. C. SCARAMUZZA (*Cuba Estac. Expt. Agron. Circ. 80 (1936), pp. 51, pls. 10*).—A practical account of the insects of importance as enemies of tobacco in Cuba, including control measures.

[Contributions on vegetable insects in Ohio] (*Ohio Veg. Growers Assoc. Proc., 23 (1938), pp. 43–56, 87–90, 116, 118, 120, 122*).—Contributions presented include Experiments on Tomato Fruit Worm in Collaboration With Georgia Experiment Station (pp. 43–47); Work in Progress in Ohio With Vegetable Crop Pests, by J. S. Houser (pp. 47–56), and Control of the Potato Leafhopper, by J. P. Sleesman (pp. 87–90) (E. S. R., 77, p. 662) (both Ohio Expt. Sta.); and Studies of Potato Insect Control, by G. F. MacLeod (pp. 116, 118, 120, 122) (Cornell Univ.).

[Contributions on fruit insects and their control] (*Ohio State Hort. Soc. Proc., 71 (1938), pp. 26–52, 58–66, 140, 142, 144, 146, 148, 150, 152, 154, 156, fig. 1*).—Contributions relating to fruit insects and their control include the following: This Game of Spraying, by C. W. Ellenwood (pp. 26–35) (Ohio Expt. Sta.); Measuring the Results of Our Spray Efforts: A Look Into the Horticultural Mirror, by T. H. Parks (pp. 35–43) (Ohio State Univ.); Non-lead Arsenicals in the Ohio Spray Program, by C. R. Cutright (pp. 44–48), and Wettable Sulfur Sprays for Apples, by H. C. Young (pp. 48–52) (both Ohio); Control of Aphis [Rosy Apple Aphid and Black Cherry Aphid] on Apples and Sweet Cherries (pp. 58–61) and Spraying Material Combinations That Increase Arsenical Injury on Apples (pp. 62–66), both by W. C. Dutton; and Parasites and the Oriental Fruit Moth, by R. B. Neiswander (pp. 140, 142, 144, 146, 148, 150, 152, 154, 156) (Ohio).

[Contributions on orchard pests] (*N. Y. State Hort. Soc. Proc., 83 (1938), pp. 8–22, 45, 46, 190–195, 210–216, 231–234*).—These contributions (E. S. R., 78, p. 511) include the following: The Season's Experience With Insects and Insecticides, by P. J. Parrott (pp. 8–22) (N. Y. State Expt. Sta.); Fighting the Codling Moth, by M. Cass (pp. 45, 46); Insect Control Problems—Early Season Sprays (pp. 190–194) and Insect Control Problems—Summer Spray Programs (pp. 210–215), both by P. J. Chapman (N. Y. State); and Mouse Control in Orchards, by D. A. Spencer (pp. 231–234).

[Contributions on citrus insects and their control in Palestine] (*Hadar, 11 (1938), No. 7, pp. 201–204, 206–208, 209, 211–213, 215–217, figs. 3*).—Contributions presented are: Comstock's Mealybug *Pseudococcus comstocki* Kuwana, a New Pest of the Citrus Groves of Palestine, by F. S. Bodenheimer (pp. 201, 202, 204); The Mediterranean Fruit Fly (*Ceratitis capitata* Wied.) in the Coastal Plain, by H. Z. Klein (pp. 203, 204); Observations on Citrus Spiders, by A. Shulov (pp. 206, 207, 208); The Various Methods of Citrus Spraying and Their Properties, by Y. Ben-Amotz (pp. 211–213, 217); and Citrus Pests in Our Groves, by E. Danin (pp. 215–217).

A decade of citrus entomology in Palestine, F. S. BODENHEIMER (*Hadar, 11 (1938), No. 1, pp. 45–50, figs. 2*).—A brief report of progress of the work with economic insects in Palestine during a period of intensive research in citrus entomology commenced by the author in 1928.

Insects injurious to nuts, E. N. Cory (*North. Nut Growers Assoc. Proc., 28 (1937), pp. 83–87*).

[Shade tree insects and their control] (*Natl. Shade Tree Conf. Proc., 13 (1937), pp. 109–117, 130–150, 159–168*).—These contributions include the following: The Holly Leaf Miner and Its Control, by G. S. Langford and E. N. Cory (pp. 109–112) (Univ. Md.); Sulphur as a Control for the Eastern Tent Caterpillar, by G. F. MacLeod (pp. 112-116) (Cornell Univ.); "Insecticides for Shade Trees," by S. W. Bromley (pp. 130–138); Tests With Derris Powder or Cube Powder in Rosin Residue Emulsion Sprays for the Control of Shade Tree Insects, by C. C. Hamilton (pp. 140–147) (N. J. Expt. Stas.); and Borer [Principally the Flat-Headed Apple Tree Borer] Control Experiments, by J. S. Houser (pp. 159–167) (Ohio).

The role of insects and allied forms in the transmission of diseases due to filterable viruses, W. A. Riley. (Univ. Minn.). (*Minn. Med., 21 (1938), No. 12, pp. 817–821*).

Investigations of the mechanism of the transmission of plant viruses by insect vectors.—II, The part played by puncture in transmission, H. H. Storey (*Roy. Soc. [London], Proc., Ser. B, 125 (1938), No. 841, pp. 455–477, pls. 2*).—Experimental studies of the transmission of maize streak disease by active races of *Cicadulina mbila* (E. S. R., 70, p. 218) are reported. It is shown that this leafhopper can take up virus from the mesophyll in a chlorotic area of a diseased leaf but not from either the mesophyll or phloem of a green area.

[Contributions on insecticides] (*Soap, 14 (1938), No. 6, pp. 109–111, 113, 115, 117, 119–125, 127, 129, 131, 133, 135, 149, 151, figs. 6*).—Contributions presented are: Roaches: A Study of the Relationship Between the Ages of Cockroaches and Their Resistance to Liquid Insecticides, by V. Tuma; Testing Fly Sprays: A Metal Turntable Method for Comparative Tests of Liquid Spray Contact Insecticides, by F. L. Campbell and W. N. Sullivan, and Insecticide Literature and Patents, by R. C. Roark (both U. S. D. A.); and New Insecticide Compound, by A. Weed.

[Factors concerned in the deposit of sprays.—IV], The deposit of aqueous solutions and of oil sprays, W. M. Hoskins and Y. Ben-Amotz (*Hilgardia [California Sta.], 12 (1938), No. 2, pp. 83–111, figs. 6*).—In the fourth of this series (E. S. R., 78, p. 660), it is pointed out that since the application of a spray is a dynamic process, attempts to relate the deposit of oil obtained from various emulsions should be based on measurements made under conditions approximating those of use. With a standard surface of beeswax as the solid sprayed and a standard method of spraying, a study was made of the relations between concentration of blood albumin, hemoglobin, or sodium oleate and the following properties: Amount of aqueous solution and of the accessory substance deposited in the absence of oil; deposit of oil, of aqueous phase, of accessory substance, and of all components when emulsions were used; ease of wetting of wax by solutions of the accessory substances and by the entire emulsion; replacement of aqueous phase by oil; and stability of the emulsions.

The amount of oil deposit can be explained at least qualitatively as follows: When only oil and water are present, the emulsion wets poorly, and drops roll on the surface with minimum area of contact. Addition of a protein promotes wetting and opportunity for oil to reach the surface. Hence deposit is increased until formation of large sheets of the aqueous phase upon the surface and resistance to displacement of the aqueous phase by oil lead to a decrease in oil deposit with higher concentration of protein. Soap promotes wetting so little that a corresponding increase in oil deposit does not occur. With all three accessory substances, the increase in stability of the emulsions diminishes oil deposit. Water-soluble substances follow the aqueous phase and increase spreading of oil only after the water has evaporated.

A list of 21 references to the literature cited is included.

The injection of spray concentrates: A new procedure for the application of insecticides, K. Groves, J. Marshall, and H. Fallscheer (*Washington Sta. Bul. 367 (1938), pp. 12, figs. 3*).—An account is given of a new method that has been devised for the use of spray chemicals as ready mixed concentrate, accompanied by a description and illustration of the synchronized spray concentrate injector employed. "The advantages of using the spray concentrate injector for applying spray mixtures are: Full utilization of the principle of inversion with decreased dosage of lead arsenate or cryolite, elimination of spray tank and agitation of finished spray mixture, increased accuracy of application by metered flow, saving in labor required to attend spray pump, and the possibility of using ready mixed spray concentrates."

The interaction of bordeaux mixture spray, sulfur, and pyrethrum dusts on potato yields and insect control, E. O. Mader, W. A. Rawlins, and E. C. Udey. (Cornell Univ.). (*Amer. Potato Jour., 15 (1938), No. 12, pp. 337–349*).—It was found that the population of the potato leafhopper (nymphs and adults) decreased with the application of increasing amounts of copper sulfate, from 96 to 98 percent control of the nymphs having been obtained when more than 48 lb. of copper sulfate per acre were used. "Applying an equal amount of copper sulfate at different schedules throughout the season showed only slight differences in the control of potato leafhoppers. A lower percentage of leafhopper nymphs belonging to the fourth and fifth instars was found on sprayed plants than on nonsprayed. Applications of sulfur and pyrethrum dusts gave an additive control of potato leafhoppers when less than 48 lb. of copper sulfate were used, and if used alone gave control similar to that of bordeaux mixture. With increasing amounts of copper sulfate up to 48 lb. to the acre the population of [potato] flea beetles decreased, giving only slightly better control when additional copper sulfate was used. Pyrethrum dust reduced this pest to approximately the same extent as 36 lb. of copper sulfate. There was only a slight reduction of this pest with sulfur dust. There was a decrease in the number of tarnished plant bugs with bordeaux mixture, sulfur, or pyrethrum. Applications of bordeaux mixture, sulfur, and pyrethrum increased the aphid population on the plants. The tip-burned leaflet counts, as recorded, are undoubtedly a composite of insect injury and maturity of the plants.

"A summary of the results from a number of experiments shows the best yield increases with bordeaux mixture, and next best with pyrethrum dust. Sulfur dust had no apparent effect on increasing yields. Pyrethrum dust used in addition to bordeaux mixture gave increased yields when compared with bordeaux mixture used alone, but they were so small as to be of doubtful significance."

Chemical reactions of lead arsenate-lime sulfur sprays, J. M. Ginsburg and L. E. Perlgut (*New Jersey Stas. Bul. 655 (1938), pp. 20, figs. 2*).—Report is made of laboratory experiments conducted with lead arsenate-lime-sulfur spray mixtures in order to study the chemical reactions involved in the formation of soluble arsenic and to ascertain the extent to which $Ca(OH)_2$ and skim milk can be depended on to prevent its formation. "Acid lead arsenate, at the rate of 3 lb. per 100 gal., was used singly and combined with various dilutions of lime-sulfur, various concentrations of calcium hydroxide, and skim milk, the mixtures being shaken for 24 hr. The filtrates of the mixtures were analyzed for soluble arsenic; total sulfur; sulfur as sulfide, as thiosulfate, as sulfate; and calcium. In a similar manner the different components present in lime-sulfur were tested separately with lead arsenate. By the same methods filtrates from different spray mixtures, exposed in thin films on shallow plates outdoors, were analyzed. The dried residues of the mixtures were also analyzed for sulfur and calcium."

The results have led to the conclusion that lime-sulfur reacts with lead arsenate in two ways. "At low dilutions, such as 1–50, no appreciable increase in soluble arsenic takes place. At dilutions of 1–100 or higher, large amounts of soluble arsenic are formed. Of the lime-sulfur components, the sulfides, especially H_2S, readily react with lead arsenate to form soluble arsenic, whereas the thiosulfate, sulfate, and sulfite of calcium do not produce appreciable increases of soluble arsenic. Lead arsenate causes a large proportion of the sulfur to precipitate from solution and accumulate as free sulfur in the residue. These changes are prevented when $Ca(OH)_2$ is added to the mixture. Calcium hydroxide when used in concentrations equal to approximately twice the amount of lead arsenate present in the lime-sulfur spray prevents formation of soluble arsenic. Skim milk, used as spreader, does not, by itself, materially affect the lime–sulfur–lead arsenate spray mixtures, but when mixed with $Ca(OH)_2$ it prevents the formation of the black lead sulfide, forming, instead, lead proteinate. This reaction produces a gray residue instead of the usual black residue."

A list of 20 references to the literature is included.

Hydrocyanic acid gas absorbed in bedding, C. L. Williams (*Pests, 6 (1938), No. 11, pp. 15–17*).—From information presented the author is led to conclude that mattresses which have been subjected to commercial fumigation should be ventilated at ordinary summer temperatures for not less than 8 hr., and preferably longer, before again being used.

An ecological survey of the Orthoptera of Oklahoma, M. Hebard (*Oklahoma Sta. Tech. Bul. 5 (1938), pp. 31, figs. 4*).—In the course of a field survey made in the summer of 1937 to determine the distribution and importance of grasshoppers in Oklahoma, in 8 different environments 17 species representing 5,723 specimens were sufficiently abundant to indicate they were causing serious damage. It was evident that members of the genus *Melanoplus* were vastly more harmful than those of any other. Of these the differential grasshopper was by far the most abundant, followed by races of *M. foedus*, a large and vigorous species characteristic of the Great Plains. Next in importance were *M. packardii*, a species of similar size and distribution, and *M. angustipennis impiger*, which averages somewhat smaller (as is true for typical *M. foedus fluviatilis*). Next to these in numbers was the two-striped grasshopper, then *M. mexicanus mexicanus*. The latter, though a much smaller insect, merits close observation. In the past, *M. spretus*, believed to be the migratory phase of this species, was capable of doing far greater injury to almost all vegetation than any other form of grasshopper inhabiting temperate North America. Its last serious outbreaks occurred in the eighties.

"A study of the relative numbers of the 17 dominant species collected in 8 habitats shows that for the period during which this survey was made *M. differentialis* was the most abundant species in alfalfa, roadside [vegetation], corn and wheat stubble, and second in numbers in the other habitats. *M. angustipennis impiger* was dominant in pasture and range and second in wheat stubble, *M. mexicanus mexicanus* was most numerous in cotton and third in alfalfa and *M. foedus iselyi* was dominant in the weeds along streams. Of economic importance as range and pasture species were *M. angustipennis impiger*, *M. differentialis*, *M. foedus fluviatilis* (pasture only), *M. packardii*, *M. bowditchi bowditchi* (range only), *M. foedus iselyi* and *Hesperotettix speciosus*. The three most important species attacking alfalfa were *M. differentialis*, *M. packardii*, and *M. mexicanus mexicanus*. Corn was attacked by *M. differentialis*, *M. bivittatus*, and *M. foedus iselyi*, and cotton by *M. mexicanus mexicanus*, *M. differentialis*, and *Trimerotropis citrina*."

A systematically arranged list of 104 species and 12 subspecies or races collected in Oklahoma, of which 17 are classed injurious, with notes on their numbers, dates, and the localities of collection, is presented (pp. 12-31).

Summary of Saskatchewan grasshopper infestations, autumn 1937, and ratings of probable outbreaks, 1938, L. C. Paul, K. M. King, and V. L. Berg (*Canada Dept. Agr., Ent. Branch, Saskatoon Leaflet 52 (1937), pp. 95, pl. 1*).

The field cricket in relation to the cotton plant in Louisiana, J. W. Folsom and P. A. Woke (*U. S. Dept. Agr., Tech. Bul. 642 (1939), pp. 28, figs. 11*).—The results of work with the field cricket, details of which are given in 7 tables, are presented with a list of 20 references to the literature cited. This insect is a source of severe but sporadic damage in cottonfields, especially during periods of drought when the plants are unable to replace the ruined leaves. Injury is caused by cutting out large pieces from the leaves, eating out the main veins, sometimes stripping small plants entirely, gnawing into stems and squares, and often eating large holes in the bolls. A study of its life history has shown that one complete generation is developed during the season, and a second generation overwinters as partly grown nymphs, but with considerable mortality.

"The eggs are deposited in the soil and hatch in the early part of the season in from 17 to 31 days, but in May and June this is reduced to from 11 to 18 days. An average of 283 eggs per female was recorded. The number of nymphal instars ranged from 9 to 12, with 10 as the usual number. The average developmental period of the nymphs was found to be about 75 days. The sex ratio as determined from the insectary rearings of the first generation was 60 percent males to 40 percent females. Seventy percent of the crickets reared were of the short-winged form. Plowing to destroy the adults hiding in soil crevices in cottonfields proved ineffective. Dusting with calcium arsenate or with calcium arsenate and paris green (3:1) was followed by some reduction in the number of crickets. Poisoned-bran mash apparently gave good control."

A new Frankliniella (Thysanoptera) from Florida, J. R. Watson and J. R. Preer. (Fla. Expt. Sta.). (*Fla. Ent., 21 (1938), No. 2, pp. 17-19, figs. 2*).—A new species collected near Melbourne and Fort Drum and in Manatee County, Fla., on the spikes of *Pontederia cordata* is described as *F. pontederiae*.

A cicada as a cotton pest, D. Isely. (Univ. Ark.). (*Jour. Kans. Ent. Soc., 11 (1938), No. 4, pp. 142, 143*).—*Diprocta vitripennis* Say, previously recorded by Newell (E. S. R., 17, p. 620) as a source of injury to cotton and corn, under the name *Cicada nigriventris*, is said to have caused severe local damage to cotton in the river bottoms of at least nine counties of Arkansas. Injury is caused by depositing eggs in the stems of cotton and corn.

Experiments in spraying with white oil emulsions against Pseudococcus citri, H. Z. Klein (*Hadar, 10 (1937), No. 11, pp. 221-223*).—A single application of 2.5 percent oil emulsions gave from 76 to 85 percent control of the citrus mealybug. The natural mortality was found to be about 70 percent during the months of July and August, when the young stages develop, and about 2 percent of adult scales.

The citrus blackfly [trans. title], J. M. Osorio (*Rev. Agr. [Habana], 1 (1936), No. 2, pp. 146-163, figs. 8*).—A practical summary of information on this pest, its natural enemies, and means of control in Cuba.

The factors underlying codling moth control, T. J. Headlee (*N. J. State Hort. Soc. News, 19 (1938), No. 2, pp. 983, 984, 997*).—A practical contribution presented at the 1937 annual meeting of the society.

Codling moth control experiments, 1937–38, K. M. Ward and A. A. Ross (*Queensland Agr. Jour., 50 (1938), No. 3, pp. 286–294, pl. 1*).—In further control work with the codling moth (E. S. R., 78, p. 824) three spray schedules were found as effective as a lead arsenate schedule. "Two of these schedules embodied a white oil and nicotine sulfate spray both in calyx and cover sprays, and in the third a lead arsenate calyx spray was followed by white oil cover sprays. A combined spray of colloidal sulfur plus nicotine sulfate and also a potash soft soap spray did not significantly reduce the amount of infected fruit."

The European corn borer in eastern Virginia, H. G. Walker, D. W. Jones, and L. D. Anderson. (Va. Truck Expt. Sta. and U. S. D. A.). (*Va. Acad. Sci. Proc., 1938, p. 41*).—The status of this pest on the Eeastern Shore of Virginia is noted. The relative abundance of the European corn borer and the yields of corn obtained from corn planted on different planting dates appear to vary considerably from year to year, depending upon weather conditions. Several strains of hybrid corn grown in the presence of a rather heavy infestation of the European corn borer give promise of producing larger yields of corn than the variety commonly grown on the Eastern Shore of Virginia.

The present status of the European corn borer, L. Haseman (*Missouri Sta. Circ. 200 (1938), pp. 8, figs. 3*).—A practical discussion of the European corn borer and its importance as viewed at the present time, prepared for the purpose of keeping Missouri farmers advised as to its status and methods used to control it in those States where it is already present.

A new entomogenous fungus on the corn earworm (Heliothis obsoleta), V. K. Charles. (U. S. D. A.). (*Phytopathology, 28 (1938), No. 12, pp. 893–897, figs. 3*).—A fungus occurring as a parasite of pupae of the corn earworm at Arlington and McLean, Va., Moorestown, N. J., and Hoopeston, Ill., was found to be quite different from *Sorosporella uvella* and is described as new under the name *Spicaria heliothis*. During the course of the investigation several species of this genus were encountered on the corn earworm.

The pale western cutworm and its control, H. L. Seamans (*Canada Dept. Agr. Pub. 615 (1938), pp. 10, figs. 8*).—A practical account of this pest, which first appeared in injurious numbers in Alberta in 1911.

The effect of certain climatic factors on the distribution of the beet webworm (Loxostege sticticalis L.) in North America, J. H. Pepper. (Mont. Expt. Sta.). (*Ecology, 19 (1938), No. 4, pp. 565–571, figs. 6*).—The southern limit of the beet webworm has been found to extend to the 55° F. annual isotherm, its eastern limit to the 25-in. annual isohyetal line, and its western limit to the 10- to 15-in. annual isohyetal line. Except for occasional outbreaks due to climatic fluctuations in areas bordering the infested region, it is unlikely that the beet webworm will ever be a problem outside of the area delimited above.

Two new pests of strawberries, Acrolophus arcanellus Clemens and A. plumifrontellus Clemens, on the Eastern Shore of Virginia, H. G. Walker and L. D. Anderson. (Va. Truck Expt. Sta.). (*Va. Acad. Sci. Proc., 1938, p. 40*).—Notes are presented on two burrowing webworms, *A. arcanellus* and *A. plumifrontellus*, which seriously injured several 3- to 5-year-old fields of strawberries on the Eastern Shore of Virginia in 1936–37. The larvae live in silken tubes in the soil and feed on the roots and the base of the plants during the summer, fall, and early spring. However, as soon as the berries began to ripen on the plants that had not been killed, the larvae ate holes in the under sides of the berries and destroyed their market value. Two species of dipterous parasites, *Distichona varia* V. d. W. and *Paradidyma singularis* Towns., were reared from these two pests.

Some notes on a leafminer in holly, G. W. UNDERHILL. (Va. Expt. Sta.). (*Va. Acad. Sci. Proc., 1938, pp. 46, 47*).—Notes are given on the holly leaf miner, of European origin, which is known to occur in North America in Alaska, British Columbia, Oregon, Washington, California, Massachusetts, Connecticut, Virginia, North Carolina, and Alabama. It makes large trumpet-shaped blotch mines on the upper surface of the leaves of holly (*Ilex apaca*). Parasitism of the pest was found to range from 18 to 54 percent, the most important of the four species reared being *Opius striativentris.*

Check list of the Lepidoptera of Canada and the United States of America.—I, Macrolepidoptera, J. McDUNNOUGH (*Mem. South. Calif. Acad. Sci., 1 (1938), pp. 272*).—This check list, the first part of which takes up so-called Macrolepidoptera, replaces that of Barnes and McDunnough issued in 1917 (E. S. R., 37, p. 563).

The influence of mosquitoes on milk production in Delaware, D. MACCREARY (*Delaware Sta. Bul. 213 (1938), pp. 21, figs. 7*).—Studies commenced at the beginning of the mosquito abatement work in Delaware are reported. Two milk-producing areas in the State, one near Lewes and the other east of Dover, were surveyed over a 3-yr. period to obtain monthly and yearly records of production per cow. Complete records from not less than 47 farms in each locality for the years 1934, 1935, and 1936 were secured. Comparable records were available for the years 1928, 1929, and 1930. By the end of 1936 mosquito-control operations in the east Dover area (Kent County) were not sufficiently advanced to have any appreciable effect on mosquitoes over the entire area. Records for the 1928–30 period showed a high point in production per cow in 1929. The local drought of 1930 together with the depression probably caused the abrupt fall in production for that year. The wholesale price of milk started downward in 1930, reaching in 1932 the lowest point in many years. Production per cow rose steadily through 1934, 1935, and 1936, although the average did not equal that of the 1928–30 period.

[Contributions on mosquitoes and mosquito control] (*N. Y. State Mus. Bul. 316 (1938), pp. 185, figs. 43*).—Mosquitoes and Wild Life as Interrelated Problems in Human Ecology, by R. D. Glasgow (pp. 7–20), A Preliminary Report on the Salt Marsh Vegetation of Long Island, New York, by N. Taylor (pp. 21–84), and Mosquitoes and Mosquito Control on Long Island, New York, With Particular Reference to the Salt Marsh Problem, by A. G. Richards, Jr., with a bibliography of eight pages (pp. 85–180), are dealt with.

A dipterous parasite of mycetophilids, W. R. THOMPSON (*Parasitology, 30 (1938), No. 2, pp. 176–180, figs. 2*).—Record is made of the parasitism of mycetophilid larvae, probably of the genus *Sciara*, collected in the vicinity of Paris, France, by an undetermined dipterous parasite.

The second introduction into Cuba of Theresia claripalpis V. D. W., parasite of the sugar cane borer (memorandum), L. C. SCARAMUZZA (*Asoc. Téc. Azucareros Cuba, Proc. Ann. Conf., 11 (1937), pp. 237, 238, fig. 1*).—A report is made of the collection of the dipterous parasite *T.* (*Paratheresia*) *claripalpis* in Antigua and Trinidad and its artificial reproduction and release in Cuba in 1937 for the control of the sugarcane borer. It is thought that the 550 mated females released were sufficient to assure the establishment of this parasite on the island.

Experimental rearings of the Amazon fly Metagonistylum minense Towns. on the yellow-headed sugar-cane moth-borer Diatraea canella

Hmpsn., L. D. Cleare (*Agr. Jour. Brit. Guiana, 8 (1937), No. 4, pp. 190–194*).—The author has found that while *M. minense* may be and has been reared artificially on *D. canella* and parasitism occurs naturally under field conditions, such parasitism is normally low and is not materially increased by artificially rearing the parasite on this host for a number of generations.

Status of the Amazon fly in British Guiana, 1937, L. D. Cleare (*Agr. Jour. Brit. Guiana, 9 (1938), No. 1, pp. 12–24*).—A survey conducted in British Guiana in 1937 has shown that the Amazon fly *Metagonistylum minense*, an introduced tachinid parasite of the sugarcane borer, is present in 73 percent of the cane examined. In such fields the fly was parasitizing an average of 16 percent of the sugarcane borer population and 0.32 percent of the *Diatraea canella* population, and taken over all fields these figures were 13.7 and 0.23 percent, respectively. The parasitism ranged from 3.4 to 36.2 percent for positive fields and from 2 to 35 6 percent in all fields. In 18.4 percent of positive fields the parasitism of the sugarcane borer was 30 percent and over.

Diapause and metamorphosis of the blowfly Lucilia sericata Meig., K. Mellanby (*Parasitology, 30 (1938), No. 3, pp. 392–402, fig. 1*).—The author's studies have shown that diapause in *L. sericata* is caused by unfavorable conditions during the larval or prepupal period.

The cauliflower maggot in the region of Saint-Omer [trans. title], L. Mesnil (*Ann. Épiphyt. et Phytogénét., n. ser., 4 (1938), No. 2, pp. 281–311*).—An account of the economic importance, biology, and means of control of a cecidomyiid enemy of cauliflower (*Contarinia torquens* de Meij., *C. nasturtii* Kief.) in France.

The Mexican bean beetle and its control in Missouri, L. Haseman and C. W. Wingo (*Missouri Sta. Circ. 199 (1938), pp. 7, figs. 3*).—A practical account of the Mexican bean beetle, which has made its appearance in the southeastern part of Missouri.

Potato flea beetles and their control, H. L. Gui (*Ohio Sta. Bul. 595 (1938), pp. 29, figs. 3*).—In the studies conducted the potato flea beetle and the tobacco flea beetle were found to be the most important flea beetle pests of potatoes in Ohio, although the pale-striped flea beetle and *Systena hudsonias* Forst. occasionally cause damage. "Life history studies of the two first-named flea beetles indicate that annually there are one complete and one partial generation of each species at Wooster. The adults begin in May to leave their hibernating quarters in the soil. The last appear as late as July. The first-brood adults, which develop from eggs deposited by the overwintered beetles, appear in the field in mid-July, and the second-brood adults appear in late August. Under Ohio conditions flea beetle injury to potatoes is confined largely to the foliage. Pyrethrum sprays reduce flea beetle populations but are not sufficiently effective to produce a commercial degree of control. Data obtained in relation to crop yield, flea beetle populations, and foliage damage support one another. They indicate that calcium arsenate at the rate of 2 lb. to 50 gal. of 4–6–50 bordeaux mixture, applied at approximately weekly intervals during the growing period, is the preferred schedule for flea beetle control on potatoes. Applications of arsenicals with bordeaux made during either the first half or the last half of the season, likewise the use of calcium arsenate-bordeaux alternated with treatments of bordeaux without an arsenical, are unsatisfactory from the standpoint of flea beetle control. When a schedule of dusts is employed, the addition of 1 lb. of calcium arsenate to 10 lb. of monohydrated copper sulfate-hydrated lime is of value in flea beetle control."

Elmis columbiensis Angell a synonym of Zaitzevia parvulus (Horn), M. W. Sanderson. (Univ. Ark.). (*Jour. Kans. Ent. Soc., 11 (1938), No. 4, p. 146*).—A note on the synonymy of this coleopteran.

The gross anatomy of the digestive and reproductive systems of Naupactus leucoloma Boh. (Curculionidae, Coleoptera), A. N. TISSOT. (Fla. Expt. Sta.). (*Fla. Ent., 21 (1938), No. 2, pp. 20–27, figs. 8*).

The plum curculio, C. GRAHAM (*Maryland Sta. Bul. 419 (1938), pp. 309–345, figs. 8*).—In observations conducted in Maryland over a period of 8 yr. the stage of development of peach trees varied from full bloom to two-thirds of the peach exposed from the shuck when the curculio first entered the orchard. No curculio entered the orchard until from 1 to 3 days after the daily mean temperature reached 55° or above. "Records over a period of 8 yr. show that the averages of the daily mean temperature from April 20 until the date on which approximately 50 percent of the curculios have entered the orchard range from 55° to 57° regardless of the date on which 50 percent have entered the orchard. Records over a period of 5 yr. on the dispersion of curculios into the orchard show that they are present on trees near woodland areas and other suitable hibernating quarters from 3 to 17 days before they reach the center of the orchard, and that the infestation is never as heavy away from their hibernating quarters as it is near it. One year's records on the egg deposition of the curculio show that the curculio will begin oviposition as soon as they leave their hibernating quarters if a suitable oviposition medium is present. The minimum number of eggs deposited by a single curculio during 1935 under laboratory conditions was 34; the maximum number was 92, with an average of 55.3. In 1936 the minimum number of eggs deposited by a single curculio was 17; the maximum number was 82, with an average of 40.5."

Field tests "show that arsenical sprays are much more effective in the control of curculios than arsenical dusts. Control methods in Maryland consist of applying three arsenical sprays, one at the petal fall stage, one when two-thirds of the peaches are exposed from the shuck, and the third 2 weeks later. Supplementary control methods consist of burning woodland, fence rows, etc., near the orchard to kill overwintering curculios, and to cultivate between July 8 and 18 to kill the pupae of the curculio."

The plum curculio as an apple pest, P. J. CHAPMAN (*New York State Sta. Bul. 684 (1938), pp. 75, figs. 34*).—A study of the biology and control of the plum curculio, a pest second only to codling moth as an enemy of deciduous fruits, is reported, the details being given in 11 tables. It appears that there is only one brood annually in New York, with the periods spent in the immature stages averaging as follows: Egg 7 days, larva in the fruit 16 days, and underground as larva, pupa, and newly transformed adult 30 days. In tests of the several arsenicals (lead arsenate, calcium arsenate, magnesium arsenate), and of natural cryolite, synthetic cryolite, nicotine tannate, nicotine bentonite, and powdered cube root, lead arsenate and calcium arsenate gave the best results and were about equally effective. Lead arsenate is the preferred material and is recommended for use at the rate of 3 lb. of the powder in 100 gal. of water or spray mixture. "Three thoroughly applied sprays should give adequate protection against the curculio where apple is the host involved. These are a calyx or petal fall application, one applied 7 to 10 days later, and the third following the second within 10 to 14 days. Preblossom treatments appeared to contribute little or nothing to curculio control. Other findings in the insecticide tests were: The standard spray formula of lead arsenate 3–100 gave better results than a 90–10 sulfur-lead arsenate dust; a part of the control obtained in spraying may be attributed to a repellent action; [and] fish oil which acts as an adhesive increased the efficiency of spray mixtures, but spreaders appeared to be neutral in their effects."

A list is given of 30 references to the literature cited.

How to stop weevil damage in stored grain, M. D. Farrar (*Illinois Sta. Circ. 489 (1939), pp. 8, figs. 2*).—A practical account.

Pollen supplies and honey production, J. A. Munro (*North Dakota Sta. Bimo. Bul., 1 (1938), No. 2, pp. 5, 6*).—An experiment is noted in which a group of colonies supplied with about 60 sq. in. of pollen-filled comb surface per colony reared brood at a 22 percent greater rate and produced 21 percent more honey than a similar group not provisioned with pollen.

The introduction and colonization in Puerto Rico of Dasyscapus parvipennis Gahan, a parasite of thrips, K. A. Bartlett (*Puerto Rico Sta. Agr. Notes No. 87 (1938), pp. 6*).—The author reports upon the introduction into Puerto Rico of the hymenopterous parasite *D. parvipennis* in March 1936 from Trinidad (E. S. R., 77, p. 71), and on the rearing of 33 generations in the laboratory and liberations made from March 1936 through May 1938. The results obtained indicate that this parasite is not able to maintain itself sufficiently under conditions obtaining on the island to be of any economic benefit in the control of the red-banded thrips enemy of the mango and other plants in Puerto Rico. It is pointed out that this parasite was first reared from the onion thrips in Java and Trinidad, and that it has been reared from this host in the greenhouse in Puerto Rico. In the United States it has been reared from the greenhouse thrips.

A study of the life cycle of the European red mite (Paratetranychus pilosus Can. & Fanz.) and its control, J. M. Grayson. (Va. A. and M. Col.). (*Va. Acad. Sci. Proc., 1938, p. 48*).—An abstract is given of a contribution on the life cycle and control of the European red mite, based upon a study in Virginia during the fall of 1935 and the spring and summer of 1936 in which the average length of the life cycle of 14 females was 15.23 days, the average length of the adult period for 28 females was 16.19, and the average length of time from the deposition of the eggs to maturity of the males (13.5 days) was slightly shorter than the corresponding period for the females (13.78 days).

"Better control was obtained against the overwintering eggs with petroleum oil, either alone or in combination with tar distillate, nicotine sulfate, or dinitro-*o*-cyclohexylphenol than with the water gas-tar oils, tar oil-wax emulsion, cresylic acid, or lime-sulfur plus nicotine sulfate. It appeared that dinitro-*o*-cyclohexylphenol added to the insecticidal value of the materials. A summer application of Ortho-K oil emulsion was very effective in killing both the mites and the eggs. Fall and midwinter applications were considerably less effective than those made in the late dormant or the delayed-dormant periods. Further work on control is in progress."

The use of selenium in sprays for the control of mites on citrus and grapes, W. M. Hoskins, A. M. Boyce, and J. F. Lamiman (*Hilgardia [California Sta.], 12 (1938), No. 2, pp. 115–175, fig. 1*).—Report is made of studies conducted, the details being given in 10 tables, together with references to the literature cited, a 6-page list of which is included. It was found that "a spray made by dissolving selenium in a solution of potassium ammonium sulfide in such proportions that the composition corresponds to the empirical formula $(KNH_4S)_5Se$ is effective for the control of mites on citrus and grapes. After several years' use, there is no evidence of harmful effects upon the plants, and fruit injury has occurred to only a limited extent in certain districts.

"Analyses of citrus fruits has shown that the residue, which is mainly free selenium, is present to the extent of 2 to practically 0 p. p. m. in the rind, according to the length of time between the application of spray and the analysis. Analyses of the soil beneath sprayed trees showed that, after 5 years' treatment, a maximum of 2 p. p. m. selenium occurred in the first 6 in., but penetration to lower depths was very slow. Absorption from the soil resulted in only a few hundredths parts per million selenium in the interior of citrus fruits.

"The residue upon grapes is somewhat greater on account of the larger surface which they present to the spray, and the analytical data indicate that they absorb somewhat more selenium from the soil.

"The data regarding the acute, subacute, and chronic toxic effects of ingested selenium have been reviewed. There is considerable evidence that 3 p. p. m. selenium in the whole diet causes no symptoms of injury. Such an amount could not be obtained from citrus fruit or grapes. Hence it is concluded that proper use of the selenium-containing spray mentioned above on citrus and grapes, under the prevalent conditions of production in California, offers no hazard to public health."

Studies of the eggs and larvae of Boophilus microplus (Canestrini 1888) [trans. title], C. Pereira (*Arch. Inst. Biol. [São Paulo], 8 (1937), pp. 135–144; Eng. abs., p. 144*).—Report is made of observations of the biology of the cattle tick of South America, the seed ticks or larvae of which refused to attack the dog, rabbit, guinea pig, and man.

ANIMAL PRODUCTION

[Investigations in animal production] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1938, pp. 124–126, 135–137*).—Progress is reported in the development of superior types of beef and dual-purpose cattle and swine through selective breeding and suitable crosses of native and imported strains; improved methods of preserving semen samples for artificial insemination; further studies in the vitamin requirements of beef cattle, swine, and poultry; increased effectiveness of the National Poultry Improvement Plan; improved methods for preservation of forage crops; and the development of wider uses for dairy byproducts.

[Animal husbandry investigations of the Bureau of Animal Industry] (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1938, pp. 9–14, 17–21, 23–25, 28, 29, 32–34*).—Results are briefly reported for the following studies: Factors influencing the quality and palatability of lamb, pork, beef, and turkeys (cooperative with 11 State experiment stations), the effect of vitamin A deficiency on the reproductive and urinary systems of cattle, the minimum vitamin A requirements of cattle, phosphorus deficiencies in range grasses, the comparative market value of yearling v. 2-year-old steers, an all-roughage ration v. limited corn and roughage in feeder cattle production, the value of molasses as a substitute for corn in steer fattening rations, continuous v. alternate grazing and moderate v. intensive grazing of native range with cattle, various systems of permanent pasture management in the midwestern and southern regions, the use of condensed whey as a preservative in soybean silage, the efficiency of controlled v. ad libitum feeding of lambs, the relative efficiency of feed utilization and milk production by different breeds and strains of sheep, the value of sugar beet byproducts for fattening lambs, range management for sheep, the use of tent shelters for range lambing, optimum sources and levels of protein for young pigs, the value of grass silage in the winter ration of pigs, the effect of condition of sows on the size and weight of litters farrowed, the effect of fattening at different stages on the body composition of cockerels, the effects of various pigmented feeds on egg yolk color, the effect of soybean meal in the diet of hens on hatchability of eggs, cod-liver oil v. irradiated ergosterol as sources of vitamin D for chickens, a comparison of methods for determining the digestibility of carbohydrates in feeds, and the vitamin B requirements of the rat. Much of the work reported was in cooperation with the State experiment stations.

[Experiments with livestock in Arkansas] (*Arkansas Sta. Bul. 368 (1938), pp. 50–60, figs. 3*).—Brief progress reports are presented on breeding sheep for spring lamb production, by W. R. Horlacher; cross-breeding chickens for broiler production, by Horlacher and W. H. Wiley; the synthesis of milk fat, by P. L. Kelly; the relation of dietary silicon to silicon content of wool and the intermediary metabolism of glycine in the fowl, both by A. R. Patton; the use of oats for silage, by Horlacher and M. Lyons; the yield of forage from various silage crops, the preservation of legumes as silage by mixing with corn or sorghum forage, a comparison of oat silage v. sorgo silage for dairy cows and of corn silage v. sorgo silage for growing calves, and the manganese metabolism of the laying hen and of the chick embryo, all by Lyons; and the value of rice byproducts in the laying ration, by R. M. Smith.

[Livestock investigations in Colorado] (*Colorado Sta. Rpt. 1938, pp. 11–14, 43–45*).—Beef cattle feeding experiments described in this report include a comparison of corn silage v. cut corn fodder in cattle fattening rations, the value of beet molasses as a partial substitute for grain, the value of cull potatoes as a succulent feed, a comparison of "C" molasses v. cane molasses in cattle fattening rations, the value of cottonseed cake and dried beet pulp as supplements to hay for wintering beef cows, and a comparison of conservative continuous v. deferred and rotated grazing on rate of gain in yearling steers.

Reports of other feeding tests include a comparison of corn v. barley for fattening lambs, and a comparison of tankage, buttermilk, and a triple mixture as protein supplements and of corn, hog millet, and rye as grain concentrates in the hog fattening ration.

Poultry investigations include the vitamin G requirements of turkey breeding stock, a comparison of native grasses for poultry range, and the role of trace elements in poultry nutrition.

[Livestock investigations in Kansas] (*Kansas Sta. Bien. Rpt. 1937–38, pp. 23, 24, 73–76, 77–79, 90, 91–93, 93–96, 126, 127, 129*).—Outstanding achievements of the station in the field of animal husbandry over the past 50 yr. are briefly summarized.

Current investigations, for which results are noted, include: The effect of different methods of processing Atlas sorgo upon returns from silage-fed stock cattle and the value of various concentrates as supplements to silage for fattening cattle, by A. D. Weber; methods of utilizing native pastures in beef cattle feeding, by C. W. McCampbell; the mineral requirements of fattening cattle, by Weber and J. S. Hughes; the comparative value of eight protein supplements fed with sorgo silage to calves, by L. C. Aicher and McCampbell; effect of a ration low in phosphorus on the quality and palatability of beef, by D. L. Mackintosh, J. L. Hall, E. McMillan, and M. Pittman; a comparison of protein supplements, of sorghum grains, and of methods of feeding for fattening lambs, by R. F. Cox and F. A. Wagner; the phosphorus requirements of pigs in the absence of vitamin D, by C. E. Aubel and Hughes; comparisons of corn v. blackstrap molasses and tankage v. expeller soybean oil meal, and the value of soybeans and soybean products in swine rations, all by Aubel; and tests of the need of milk sugar for cerebroside formation, by C. H. Whitnah and W. S. Caulfield.

Poultry investigations gave information on the relation of hatching date to income from eggs, a comparison of dehydrated alfalfa v. immature oat-plant meal and of green alfalfa v. young cereal grasses in chick rations, the value of grass silage for poultry, the stability of carotene in dehydrated alfalfa and oat-plant meal, and the factors influencing feathering in chicks, all by L. F. Payne and D. C. Warren; growth comparisons of Bronze and Narragansett turkeys and the relation of altitude and temperature to feathering of turkeys, both by T. B. Avery; factors influencing color of egg yolks, by Hughes and Payne; and the mechanism and chemistry of egg formation, by Warren and R. M. Conrad.

[Livestock investigations in West Virginia], E. A. Livesay, M. L. Buchanan, A. H. VanLandingham, C. V. Wilson, T. B. Clark, J. H. Rietz, C. E. Weakley, Jr., and E. T. Wightman (*West Virginia Sta. Bul. 290 (1938), pp. 4–6, 7–9*).—Results are briefly reported on the comparative yield and composition of silage from Cocke Prolific and Boone County White corn; finishing beef calves on pasture with limited grain feeding; the effect of backcrossing Corriedale rams on crossbred ewes on the wool and mutton qualities of the progeny; a comparison of the efficiency of various animal and plant proteins, singly and in combinations, in poultry rations; the effect of the level of protein feeding on poultry mortality; natural feeds as a source of manganese in poultry rations; the maximum utilization of home-grown grains for poultry; the effect of the diet on interior egg quality; and the comparative market qualities of purebred v. crossbred turkeys.

Protein studies: Plant proteins, I, II (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 10 (1938), No. 1, pp. 193–219*).—The results of two studies are summarized.

I. *A comparative study of the growth-promoting properties of the proteins of peanutmeal, sesamemeal, coprameal, lucernemeal, and cottonseedmeal*, D. B. Smuts.—Employing the paired-feeding method with rats, it was found that the protein of cottonseed meal was significantly superior to that of peanut meal. There was no statistical difference in the growth-promoting value of the proteins of peanut meal and copra meal or of peanut meal and sesame meal, while alfalfa meal was definitely inferior to peanut meal as a source of protein.

II. *The biological values of lucernemeal, sesamemeal, peanutmeal, coprameal, cottonseedmeal, and oatmeal*, D. B. Smuts and A. I. Malan.—By means of nitrogen metabolism studies with rats, the biological values of the proteins of oatmeal, cottonseed meal, peanut meal, sesame meal, copra meal, and alfalfa meal were found to be 84, 81, 72, 71, 69, and 60–61, respectively. The protein of oatmeal appeared to be entirely digested, while that of cottonseed meal, peanut meal, sesame meal, copra meal, and alfalfa meal was 92, 90, 92, 89, and 74 percent digestible, respectively.

Legume and grass silage: A survey of methods and results on 380 Northeastern farms. (Coop. 10 States). (*Maryland Sta. Spec. Bul. 411 (1938), pp. 23, figs. 3*).—Noted as New Jersey Stations Bulletin 643 (E. S. R., 79, p. 373).

Inspection of commercial feedstuffs, P. H. Smith (*Massachusetts Sta. Control Ser. Bul. 94 (1938), pp. 68*).—This report presents results of analyses of 1,721 samples of feeding stuffs intended for livestock and poultry consumption, collected during the year ended September 1, 1938 (E. S. R., 79, p. 88). Information and analyses relative to the vitamin A content of alfalfa products and the manganese content of commercial poultry rations are given special mention.

Synthesis of the antihemorrhagic vitamin by bacteria, H. J. Almquist, C. F. Pentler, and E. Mecchi. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 3, pp. 336–338*).—Further experiments confirm previous findings (E. S. R., 75, p. 96) that ether-extracted, vitamin K-free fish meal when allowed to putrefy through the action of micro-organisms developed an appreciable amount of antihemorrhagic activity as assayed with chicks. A sterile fish meal control gave no evidence of such activity. When an organism isolated from the putrid fish meal was grown on various liquid and solid media, the washed bacteria were found to be rich sources of the antihemorrhagic factor. Several known species of the bacteria were grown in nutrient agar, suspended in saline, repeatedly washed, autoclaved, and added to the basal diet of chicks for assay. All but one of the species thus tested possessed definite antihemorrhagic properties, indicating that this factor is a product of bacterial metabolism.

The lack of nerve degeneration in uncomplicated vitamin B_1 deficiency in the chick and the rat, R. W. Engel and P. H. Phillips. (Wis. Expt. Sta.). (*Jour. Nutr., 16 (1938), No. 6, pp. 585–596*).—When chicks were fed a vitamin B_1-deficient diet or a normal diet at restricted levels, myelin sheath degeneration in the sciatic nerve occurred in a high percentage of cases. However, the administration of vitamin A concentrate in the form of β-carotene or percomorph oil, together with riboflavin, removed all evidence of pathology in the peripheral nerves when such diets were fed. Histological observations on a large number of rats indicated that neuropathology seldom occurred when the animals received a vitamin B_1-deficient but otherwise adequate diet. A histologic change indicative of fatty degeneration of the liver was observed when vitamin B_1-deficient symptoms in the rat were cured by the administration of crystalline vitamin B_1. These findings led to the conclusion that uncomplicated beriberi is not accompanied by peripheral nerve degeneration.

Vitamin C studies in the rat: The effect of selenium dioxide, sodium selenate, and tellurate, J. L. Svirbely (*Biochem. Jour., 32 (1938), No. 3, pp. 467–473*).—In studies at the Carnegie Institute of Technology, rats receiving subcutaneous injections of selenium or tellurium salts for a brief test period and then sacrificed showed typical symptoms of selenium and tellurium poisoning and a marked decrease in the vitamin C content of the liver and adrenals. In vitro experiments indicated that the amount of ascorbic acid removed by selenium dioxide, sodium selenate, and sodium tellurate paralleled the order of toxicity of these salts, with evidence that the production of oxidized glutathione by selenium salts may account for the decrease in ascorbic acid. Selenium salts were reduced more readily by ascorbic acid than by glutathione or cysteine, while the reverse relationship held true for sodium tellurate.

The vitamin D content of some South Dakota roughages, G. C. Wallis and H. Lardy. (S. Dak. State Col.). (*S. Dak. Acad. Sci. Proc., 18 (1938), pp. 46–49*).—The vitamin D content of several native roughages was determined, using the standard line-test technic. Three alfalfa hay samples contained 500, 1.588 and 2,760 International Units of vitamin D per pound, respectively. The last sample was comprised of 50.6 percent stems, containing 780 I. U. per pound, and 49.4 percent leaves, containing 4,740 I. U. per pound (E. S. R., 80, p. 238). A sample of prairie hay contained 250 I. U. per pound, while two samples of beet pulp assayed were devoid of vitamin D potency.

Manganese content of some South Dakota feeds, A. L. Moxon and H. Lardy. (S. Dak. State Col.). (*S. Dak. Acad. Sci. Proc., 18 (1938), pp. 57–60*).—The manganese content of 26 samples of feeding stuffs is reported. Six samples of corn ranged from 2 to 9 p. p. m. of manganese, 3 samples of barley from 14 to 19, 2 of millet from 9 to 11, and 3 of wheat from 34 to 60, while 118 p. p. m. in wheat bran is the highest value recorded.

Sulphur metabolism.—V, The effect of elementary sulphur on fertility, reproduction, and lactation in the white rat, J. H. Kellermann (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 10 (1938), No. 1, pp. 221–226*).—Continuing these studies (E. S. R., 77, p. 829), it was found that incorporating 3 percent of elemental sulfur in the stock ration of white rats had no effect on fertility, reproduction, or lactation of these animals. Feed was utilized with about equal efficiency in the experimental and control groups. There was no difference in body weight of the young from the two groups, but at weaning age the offspring of the control group were slightly heavier than those from the sulfur-fed rats.

Fluorine toxicosis in the albino rat, J. A. Schulz (*Iowa Sta. Res. Bul. 247* (*1938*), *pp. 165–242, fig. 1*).—The toxicity of various fluorine compounds in combination with various supplements has been extensively studied. When sodium fluoride was fed to albino rats at 0.01 percent of the ration, toxicity was expressed only by mottling of the pigment of the incisor teeth. At 0.025- and 0.05-percent levels, growth was somewhat inhibited, and at the latter level the incisors became definitely elongated and chalky in appearance and reproduction was less certain. At 0.1- and 0.15-percent levels, growth and reproduction were generally poor, accompanied by other complications, and the incisors became greatly elongated. When fed at 0.2- and 0.25-percent levels, death generally resulted in a few weeks. At the higher levels of feeding, the long bones showed a relatively high fluorine content accompanied by an increased percentage of magnesium and a decreased percentage of carbon dioxide. No regular changes in the calcium or phosphorus of the bones due to fluorine feeding were observed, and the mineral composition of the incisors was not appreciably affected by the feeding of fluorides. The fluorine toxicosis was accentuated by a low percentage of calcium and somewhat ameliorated by a high percentage of calcium in the ration. Under certain conditions, the presence of cod-liver oil in the ration had an ameliorating effect on the toxicity of the sodium fluoride. Calcium fluoride was much less toxic than sodium fluoride. Fluorine present in the rock phosphate was only slightly less toxic than sodium fluoride at the same levels of fluorine intake, while the fluorine in phosphatic limestone and also residual fluorine in superphosphate were less toxic than fluorine in rock phosphate. The results failed to indicate a level at which earthy phosphates might safely be fed to farm animals.

[Fifteenth annual report of the activities of the National Live Stock and Meat Board for the fiscal year 1937–38], R. C. Pollock (*Natl. Livestock and Meat Bd. Ann. Rpt., 15* (*1938*), *pp. 116, figs. 109*).—This report (E. S. R., 77, p. 833) contains accounts of researches on the role of meats and animal fats in nutrition, including progress reports of the cooperative meat investigations being conducted by various State experiment stations and the U. S. Department of Agriculture.

Relative merits of producing creep-fed, feeder, and lot-fattened calves in the Appalachian region, E. W. McComas and C. V. Wilson. (Coop. W. Va. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 664* (*1938*), *pp. 12*).—In experiments conducted at Lewisburg, W. Va., over a 3-yr. period, the rate and economy of gain of (1) creep-fed beef calves running with their dams on highly productive bluegrass pasture, (2) noncreep-fed calves handled under similar conditions, and (3) calves receiving no supplement while with their dams on less productive mountain pasture were compared. The creep-fed calves which consumed an average of 2.65 lb. per head daily of the corn-cottonseed meal supplement averaged 8 and 25 percent greater gain than calves in groups 2 and 3, respectively. The creep-fed calves were fat enough to be classed as slaughter cattle when weaned at an average age of 230 days, while the noncreep-fed calves on similar pasture were classed as feeders at weaning age and required approximately 4 months' fattening in dry lot to attain good market grade. The creep-fed calves consumed an average of only 123 lb. of grain per 100 lb. of gain, while the calves in group 2 required 686 lb. of grain and 318 lb. of alfalfa hay per 100 lb. of gain during the dry-lot fattening period.

Nutritional blindness in steers, S. H. McNutt and J. F. Wall. (Iowa State Col. et al.). (*Vet. Med., 33 (1938), No. 11, pp. 497–499, fig. 1*).—This report describes a type of blindness occurring in a lot of fattening steers which were being fed a mixed concentrate ration with oat straw as a roughage. Postmortem examination of blind animals revealed excessive degeneration of the optic nerve and congestion about the nerves of the eye, but no evidence of infection in the eye or other body tissues. This type of blindness, occurring without external visible lesions, appeared identical with that described by Kuhlman et al. (E. S. R., 76, p. 525) and is ascribed to faulty nutrition.

Effect of castration of lambs on their development and quality of meat, W. E. Hunt, D. Meade, and B. E. Carmichael. (Coop. U. S. D. A.). (*Maryland Sta. Bul. 417 (1938), pp. 259–278, figs. 3*).—In three trials comparing ram and wether lambs similarly fed and slaughtered at ages varying from 5 to 52 weeks, there was no significant difference in the average rate of gain of rams and wethers either on pasture or in dry lot. The rams tended to be slightly heavier at younger ages, but there was little difference between lots at 44 to 52 weeks of age. The wethers excelled in dressing percentage at all ages except at 5 and 15 weeks of age, the average dressing percentage being 49.5 and 47.4 for wethers and rams, respectively. Little difference was noted in the chilling shrink of the carcasses. There was a small advantage in average carcass grade in favor of wethers, particularly at 1 yr. of age. The wethers showed a greater weight of fat and a higher percentage of fat in the rib cuts than did the rams, especially at older ages. The weight and percentage of blade and arm bones and weights of head, caul fat, and pelt averaged greater for the rams. The wethers had a higher plumpness index for both leg and shoulder, a darker red color of shoulder muscle, and more tender leg muscle (mechanical shear test) than the rams. Shoulder roasts showed cooking losses of 15.6 and 16.4 percent for wethers and rams, respectively, but no significant differences were noted in aroma, texture, tenderness, juiciness, or desirability and intensity of flavor of fat and lean in the shoulder roasts from the two lots.

The feeding value of western Canadian barley for bacon hogs (*Ottawa: Dominion Dept. Agr., [1938], pp. [3]+61*).—This interim report of the subcommittee of the National Barley Committee, appointed to study the feeding value of western Canadian barley, summarizes the results of the 1937 feeding trials comparing the value of No. 3 C. W. barley, No. 3 C. W. oats, yellow corn, barley, and oats, and corn and oats in the ration of bacon hogs. This uniform test was replicated at five experimental stations in Nova Scotia, Quebec, and Ontario. As measured by live weight gains and feed efficiency, the barley ranked first, followed in order by corn, corn and oats, barley and oats, and oats. The barley proved equally as palatable as corn in all cases. On the basis of carcass score the barley-fed hogs yielded fully as good carcasses as those on heavy corn rations. The inclusion of oats reduced the feeding value or barley, though only slightly decreasing the carcass quality.

Pork production, C. I. Bray (*Louisiana Sta. Bul. 303 (1938), pp. 30, figs. 9*).—The principal topics of discussion are types of pork production, breeding, feeds for hogs, protein supplements, hogging off feed crops, pastures in pork production, hog houses, equipment, general care and management, marketing, and sanitation and disease prevention.

[Salt penetration and moisture loss in hams during the curing process]. (Coop. U. S. D. A.). (*Maryland Sta. Rpt. 1938, pp. 33–35, fig. 1*).—Progress results are noted.

Osteofibrosis in equines, J. W. Groenewald (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 9 (1937), No. 2, pp. 601–620, figs. 26*).—In this study three

2-year-old fillies receiving a low calcium ration (4.5 g of CaO daily) with low calcium : phosphorus ratios developed clinical and histopathological symptoms of osteofibrosis. These animals lost weight and became emaciated and were continually in negative calcium balance. Two control fillies receiving the same basal diet supplemented with 75 g of calcium carbonate daily grew as well and remained in normal condition. Facial enlargements caused by this disease were not reduced in size by later feeding a calcium supplement. The data indicate that blood calcium determinations are of little value for diagnostic purposes in cases of suspected osteofibrosis.

The ability of the dog to utilize vitamin A from plant and animal sources, D. BRADFIELD and M. C. SMITH. (Ariz. Expt. Sta.). (*Amer. Jour. Physiol., 124 (1938), No. 1, pp. 168–173*).—The administration of 20 U. S. P. units of vitamin A per 100 g of body weight in the form of cod-liver oil, carotene in oil, or carrots promoted normal growth and provided a slight storage of the vitamin in 20 5- to 7-week-old puppies fed a vitamin A-deficient diet for from 14 to 22 weeks. When the vitamin A intake was increased to 40 units the storage increased about 1.5 to 2 times as compared to 20 times at the 100-unit level and 30 to 40 times at the 200-unit level of vitamin A per 100 g of body weight. It is concluded that the minimum vitamin A requirement of the young growing puppy is about 15 U. S. P. units per kilogram of body weight.

Advances in poultry nutrition, L. C. NORRIS. (Cornell Univ.). (*Flour & Feed, 39 (1939), No. 8, pp. 8, 9, 33, 34*).—A summary, with particular reference to the quantitative requirements of poultry for calcium, phosphorus, manganese, the vitamins A, B, D, G (riboflavin), and the antidermatitis factor.

An individual chick cage for use in poultry nutrition studies, A. E. TEPPER. (Univ. N. H.). (*Poultry Sci., 17 (1938), No. 6, pp. 451–453, figs. 2; also New Hampshire Sta. Sci. Contrib. 66 [1938], pp. 451–453, figs. 2*).—An individual chick cage which has proved very satisfactory in nutrition studies is described and illustrated.

[Poultry research in Maryland] (*Maryland Sta. Rpt. 1938, pp. 85, 86, 87*).—Studies on the effect of brief incubation on egg quality and the relative vitamin A potency of brown- and white-shelled eggs are briefly noted.

[Poultry investigations in Michigan] (*Michigan Sta. [Bien.] Rpt. 1937–38, pp. 32, 33*).—Results are briefly presented on the value of artificial illumination for breeding turkeys; a comparison of ground oats, ground oat groats, and wheat bran for starting rations for chicks; and the effect of cottonseed oil in the ration of laying hens on egg quality.

Feeding systems for laying hens, M. O. NORTH (*Wyoming Sta. Bul. 230 (1938), pp. 15, fig. 1*).—Six methods of feeding laying hens the same rations have been compared over a 3-yr. period. The mash ration was self-fed in all cases, while grain was fed as follows: (1) Hand-fed, one-third in morning, two-thirds in evening; (2) hand-fed in evening; (3) self-fed in afternoon; (4) hand-fed in morning; (5) self-fed all day; and (6) included in an all-mash ration. The all-mash system slightly excelled the others from the standpoint of total egg production and feed cost per dozen eggs produced. There were no significant differences between the systems with reference to egg weight, mortality, gain in body weight, fertility, or hatchability.

The gonadotropic hormone and the level of blood phosphorus in the hen, M. LASKOWSKI (*Biochem. Jour., 32 (1938), No. 7, pp. 1176–1180, figs. 5*).—Following single injections of gonadotropic hormones prepared from pituitary gland or mare serum into resting hens, the appearance of serum vitellin in the blood stream, accompanied by a rise in other phosphorus fractions in the blood, was observed. This increase in total phosphorus reached a maximum from 4 to

6 days after injections, followed by a decrease to approximately normal levels in from 10 to 12 days. Administering gonadotropic hormones of urinary origin had no influence on the blood phosphorus level. The effect of such injections was too variable to be applied to assay of the hormones but might be used as a means of differentiating urinary and pituitary hormones.

Evidence of a new growth factor required by chicks, E. L. R. Stokstad and P. D. V. Manning (*Jour. Biol. Chem., 125 (1938), No. 2, pp. 687–696, fig. 1*).—Evidence is reported to indicate that chicks require a growth factor which is not identical with the previously described vitamins and which is present in large amounts in alfalfa, middlings, wheat bran, and yeast, to a lesser extent in corn, and to a very slight extent in polished rice. The factor is insoluble in ether, acetone, and isopropanol, but is soluble in water and mixtures of water and methanol. It can be adsorbed on fullers' earth or activated charcoal and can be readily eluted from the fullers' earth adsorbate. Autoclaving alfalfa destroyed the factor, while autoclaving yeast did not destroy it. Refluxing in acid and in alkali media did not destroy the factor contained in the yeast extract. It is tentatively designated as factor U.

Loss, during storage, of vitamin A from alfalfa leaf meals fed to chickens, B. W. Heywang and R. B. Morgan (*U. S. Dept. Agr., Tech. Bul. 632 (1939), pp. 8*).—In a series of trials at the Southwest Poultry Experiment Station, Glendale, Ariz., the vitamin A potency of artificially dehydrated and sun-cured alfalfa meals stored in paper-lined burlap bags for periods of 1, 4, 7, 14, and 24 mo. was determined. The various meals were fed at 0.5-, 1-, and 2-percent levels as supplements to a vitamin A-deficient basal diet, the relative vitamin A potencies being measured in terms of viability, rate of growth, and efficiency of feed utilization of chicks over 70-day experimental periods. The meals showed only a slight loss in vitamin A content after being stored from 7 to 9 mo., while a marked loss occurred after 14- to 16-mo. periods, and very pronounced losses were evident after from 24 to 26 months' storage. The artificially dehydrated meal (dried at 1,100° F.) declined in vitamin A content more rapidly than the sun-cured meals, the former having approximately the same potency after 14 months' as the latter after 24 months' storage.

Fowl leukemia and vitamin E.—A preliminary report, W. J. Butler and D. M. Warren (*Jour. Amer. Vet. Med. Assoc., 92 (1938), No. 2, pp. 204–206*).—In tests conducted by the Montana Livestock Sanitary Board, about 1,000 paralyzed fowls in western commercial flocks received intramuscular (breast) injections of from 1 to 2 cc of cold-pressed wheat germ oil of high vitamin E potency. Quick recovery from paralysis occurred in a high percentage of cases, suggesting the possible value of vitamin E as a therapeutic agent in preventing this type of disorder and the need for further research in this field.

Meat production in chickens, F. P. Jeffrey (*New Jersey Stas. Bul. 656 (1938), pp. 27, figs. 2*).—The results of three lines of investigation are reported. A comparison of Rhode Island Red, Barred Plymouth Rock, and a first-generation cross of Rhode Island Red males by Barred Plymouth Rock female chicks indicated that the crossbred chicks of both sexes were heavier at 10 and at 20 weeks of age, had a lower percentage of mortality to 20 weeks, and required slightly less feed per unit of gain than the corresponding sexes of either purebred group, particularly the Rhode Island Reds. The superiority of the hybrids in rate of gain was most pronounced during the first 10 weeks. A comparison of the relative value of corn and oats in the ration under pen-fattening conditions showed little difference in the average weight of all chicks in the two lots at either 8, 12, 20, or 24 weeks of age, and, further, pen fattening as practiced in these experiments did not produce significantly more gain in weight than did no fattening. However, pen fattening of roasters did improve their eating quality. A comparison of the corn- and oat-fed groups indicated that corn was superior in improving eating quality, although the oat-fed groups were superior in desirability of flavor of fat. A study of the economy of meat production with White Leghorn capons indicated that they may be utilized economically as fryers or light roasters, but production costs were too high to warrant carrying them to the 5-lb. or heavier stage.

Histology of the oviduct of the fowl in relation to variations in the condition of the firm egg albumen, R. K. Cole. (Cornell Univ.). (*Anat. Rec., 71 (1938), No. 3, pp. 349–361, figs. 8*).—Studies were made on the interior quality of eggs from 80 White Leghorn females. Fourteen birds from this lot, which could be paired with reference to similar egg weight and at the same time represent extremes as to condition of the firm albumen, were sacrificed, and the oviducts were removed for histological study. Albumen sections from last-laid eggs from these birds were also studied.

The firm albumen of good consistency consisted of numerous closely packed mucinlike fibers characterized by their ability to take the specific mucin stains, while that of poor consistency consisted of relatively few, sparsely distributed mucin fibers. These mucin fibers were produced by the goblet cells lining the oviduct, particularly those in the posterior half of this organ. These cells showed a gradual increase in height from the interior to posterior region, reaching a maximum at the junction with the isthmus. Birds producing firm albumen of good condition possessed consistently higher goblet cells throughout the albumen-secreting region than those producing a watery type of albumen.

The effect of temperature and time on the interior quality of eggs, L. A. Wilhelm and V. Heiman. (Wash. Expt. Sta.). (*U. S. Egg and Poultry Mag., 44 (1938), No. 11, pp. 661–663, 712, figs. 2*).—Eggs from White Leghorn pullets which had been classified for their individual albumen index (E. S. R., 77, p. 87) were used in this study. Seven lots of eggs were stored at temperatures of 30°, 50°, 70°, and 90° F., each lot containing groups of eggs of high, medium, and low initial albumen index. These eggs were removed from storage after periods ranging from ⅛ day to 192 days, and the albumen index was determined for each egg.

The eggs of varying initial quality stood up under storage conditions in proportion to their original score, the percentage loss being approximately the same for each group. At 30°-storage temperatures eggs lost about 30 percent in albumen score in 48 days, and about 44 percent in 192 days. At 50°, 70°, and 90° loss in score occurred at increasingly rapid rates, those at 70° and 90° declining 71.7 percent in albumen index in 32 and 8 days, respectively.

Quality of infertile eggs, J. E. Perry. (Univ. Calif.). (*U. S. Egg and Poultry Mag., 44 (1938), No. 9, pp. 537, 566, 567*).—Quality measurements were made on infertile eggs when fresh and after 2, 15, and 120 hr. of incubation. A slight decrease in quality, particularly in albumen height, was observed after 2 hr. After 15 hr. the eggs declined 65, 93, 22, 19, and 14 percent in candling score, albumen height, yolk height, albumen score, and air-cell character, respectively, and a further decrease in quality occurred with 120 hr. of incubation. The candling appearance of eggs incubated 15 hr. seemed to indicate a greater deterioration than had actually taken place, so that it is doubtful if they would have been able to pass requirements for the U. S. Standard grade from the standpoint of candling appearance. The poaching quality of such eggs was very similar to that of U. S. Standard grade eggs as graded by a commercial distributor.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in Kansas] (*Kansas Sta. Bien. Rpt. 1937–38, pp. 79–90, 91*).—Results are briefly reported for the following studies: Factors influencing the mineral metabolism of dairy cattle, by W. H. Riddell, H. W. Cave, J. S. Hughes, and C. H. Whitnah; and straw as a feed for heifers and cows, the palatability and yield of various perennial and annual pasture plants, the carotene content of pasture plants, rotational v. continuous grazing, the use of cod-liver oil concentrate with calves fed fresh or remade skim milk, commercial starter rations for raising calves, and prairie hay in the ration of calves, all by Cave and F. W. Atkeson; and the carotene metabolism of cattle, by Whitnah and W. J. Caulfield.

Investigations with dairy products, by G. H. Beck, Caulfield, Cave, V. D. Foltz, W. H. Martin, D. L. Murray, C. K. Otis, F. L. Parsons, Whitnah, and F. E. Nelson, include normal variations in the composition of milk, the effect of various feeds and feeding practices on the flavor of milk, factors involved in oxidized flavor development, the use of the phosphatase test in determining efficiency of pasteurization, a comparison of tests for butterfat in milk and cream, factors affecting the quality of cream, color variations in creamery butter, the effect of starter distillate on flavor of butter, the use of Parafilm in packaging loaf cheese, power requirements in freezing ice cream, the development of organisms in ice cream on tryptone-glucose-skim milk agar, the prevalence of *Escherichia-Aerobacter* organisms in ice cream, media for determining proteolytic organisms in dairy products, the resazurin test as an indicator of the quality of milk, and the production and occurrence of riboflavin and flavin.

[Dairy cattle investigations in Montana] (*Montana Sta. Rpt. 1937, p. 44*).—Progress is reported on experiments at the Huntley Substation dealing with the use of high-quality roughages as sole rations for milking cows and the productive value of irrigated tame grass pastures for dairy cattle.

[Experiments with dairy cattle and dairy products in West Virginia], H. O. Henderson, R. A. Ackerman, G. G. Pohlman, G. A. Bowling, A. H. VanLandingham, W. C. Brown, and L. J. Manus (*West Virginia Sta. Bul. 290 (1938), pp. 10–15*).—Studies for which results are noted include the value of Sudan grass as a summer grazing crop for dairy cows, the effect of various fertilizer treatments on the returns secured from permanent pasture with dairy heifers, a comparison of simplified v. complex rations for dairy cows, the normal variation in blood phosphorus of young cows during gestation and lactation, improved methods of breeding with Ayrshire cattle, factors involved in the development of oxidized flavor in milk, and the effectiveness of sterilizing utensils and cooling in improving the keeping quality of the cream.

Idaho bull associations, D. L. Fourt and I. H. Loughary (*Idaho Sta. Bul. 223 (1938), pp. 27*).—The benefits to be derived from bull associations and numerous problems of organization and management of associations are discussed, based on the results of a detailed study of 48 cooperative bull associations organized in Idaho between 1919 and 1938.

The nutritive value of home grown roughage rations for dairy cattle, R. E. Hodgson, J. C. Knott, V. L. Miller, and H. K. Murer (*Washington Sta. Bul. 366 (1938), pp. 80, figs. 8*).—The experiment described extended over a period of 3 yr., in which 3 lots of 10 Holstein cows each were all allowed permanent pasture without supplement during the summer and in winter were fed (1) hay alone, (2) silage alone, and (3) a combination of hay and silage. No supplements other than salt and iodine were given. The experiment consisted of 5 phases, (1) the composition and nutrient changes in forage during harvesting and preservation, (2) the apparent digestibility of the roughage rations, (3) the feeding value of the home-grown all-roughage rations for growing and producing dairy cattle, (4) the influence of the all-roughage rations on the calcium and inorganic phosphorus content in the blood serum of dairy cattle, and (5) the relation of color and carotene of roughages to the color, carotene content, and vitamin A activity of the butterfat.

Curing of the forage into hay resulted in a reduced percentage of crude protein, ether extract, and phosphorus, and an increased percentage of crude fiber in the dry matter. The dry matter of the silage averaged somewhat higher in crude protein, ether extract, crude fiber, and phosphorus and lower in nitrogen-free extract than the fresh material from which it was made. The total losses of crude protein and total nutrients were somewhat higher in material stored as silage than in that stored as hay. The apparent digestibility of hay and silage prepared from the grass and clover mixture was approximately the same except for crude fiber, which was consistently higher in silage. On a dry-matter basis the silage averaged 35 percent higher in crude protein and 5 percent higher in total digestible nutrients than hay prepared from the same material, while the pasture grass was considerably higher in digestible nutrients than either hay or silage. The average daily production of 4-percent milk for the total period was 19.8 for cows receiving pasture and hay, 19.4 for those receiving pasture and silage, and 19.8 lb. for those receiving pasture, hay, and silage. The hay and silage rations appeared equally palatable. The average daily consumption of digestible nutrients of cows on silage alone was 86 percent of that for cows on hay and 84 percent of that for those on hay and silage. Turning cows on pasture caused an immediate and highly significant increase in milk production, regardless of calving time. The cows tended to lose weight during winter feeding and to regain it during the pasture season. In comparison with previous records made on normal rations, the cows on all-roughage rations produced 76 percent as much milk and 72.5 percent as much butterfat as when grain was fed. In general, the calcium and phosphorus contents of the blood serum of cows on the three all-roughage rations remained within normal variations. The results of the carotene studies have been previously noted (E. S. R., 80, p. 389). A complete tabulation of the data is appended.

A study of ketosis of "acetonemia" in dairy cows (*Michigan Sta.* [*Bien.*] *Rpt. 1937–38, pp. 15, 16*).—The acetone bodies present in the blood and urine of normal cows and those suffering from ketosis are reported. The feeding of molasses or glucose or access to young pasture grasses was effective in correcting this disorder.

The cleaning of milk utensils, L. H. Burgwald (*Ohio Sta. Bimo. Bul. 196* (*1939*), *p. 4*).—A comparison of the number of bacteria present in 5-gal. milk cans which had been similarly cleaned and held for 24 hr. in a moist and dry condition, respectively, at room temperature showed that an enormously greater increase in number of bacteria occurred in the moist cans. Other suggestions are offered for cleaning and sterilizing dairy utensils.

Incidence of off-flavors in milk (*Michigan Sta.* [*Bien.*] *Rpt. 1937–38, pp. 16, 17*).—The frequency with which various types of off-flavors were observed in 920 lots of market milk is reported.

A tracer for use in cream for manufacturing purposes and a method for its detection (*Maryland Sta. Rpt. 1938, pp. 37, 38*).—The use of annatto is discussed, and a method for its detection is described.

Bacteriology of butter.—VI, Effect of moisture dispersion in butter on growth of bacteria, H. F. Long and B. W. Hammer (*Iowa Sta. Res. Bul. 246*

(*1938*), *pp. 146–163, figs. 6*).—Continuing this series of studies (E. S. R., 69, p. 575), the effect of the degree of moisture dispersion in butter on the distribution and growth of various types of bacteria was investigated. With unsalted butter held either at 21° or 5° C. bacteria grew most rapidly in underworked butter and slowest in the thoroughly worked butter. When examined by the modified Burri smear-culture method, slopes from underworked or moderately worked butters showed more irregular distribution and more rapid growth of bacteria than those from thoroughly worked samples. When lots of cream, each inoculated with pure cultures of an organism causing a defect in butter, were churned, spoilage occurred more rapidly in underworked than in thoroughly worked samples either at 21° or 5°. In unsalted butters made with butter culture the pH of the serum decreased more rapidly and reached lower final values in underworked than in thoroughly worked samples. Butters from cream inoculated with lipolytic organisms also showed higher values of fat acidity in the underworked than in the well-worked samples. Apparently finer dispersion of the moisture droplets obtained by thorough working reduced the food supply in infected droplets and thus retarded microbiological deterioration.

Influence of growth temperature on the thermal resistance of some bacteria from evaporated milk, D. R. Theophilus and B. W. Hammer (*Iowa Sta. Res. Bul. 244* (*1938*), *pp. 73–111, figs. 2*).—Organisms used in this study were isolated directly from spoiled evaporated milk, directly from normal-appearing evaporated milk, and from raw milk. Attempts were made to grow each organism isolated at 10°, 21°, 37°, 45°, and 55° C. Growth was never obtained at 10°, and none of the organisms had a growth range from 21° to 55°. Growth at the approximate optimum temperature commonly yielded spores with greater thermal resistance than growth either above or below that temperature. Sudden decreases in growth temperature from the optimum generally decreased and sudden increases usually increased the thermal resistance of the spores, although continued growth at the changed temperature tended to yield spores with thermal resistance approximating that of the spores in the cultures originally grown and tested at those temperatures. Freshly dried spores or dried spores aged from 47 to 69 days were not significantly different from moist spores in thermal resistance. With most cultures the survival period of spores decreased sharply as the temperature increased from 104° to 120°. A strain of *Bacillus megatherium* isolated from spoiled evaporated milk had high thermal resistance, while a strain of the same organism isolated from raw milk did not. Ninety-two references are cited.

VETERINARY MEDICINE

Principles of veterinary science, F. B. Hadley (*Philadelphia and London: W. B. Saunders Co., 3. ed., reset, pp. 594,* [*pl. 1*], *figs. 127*).—An entirely reset edition of this practical work (E. S. R., 52, p. 197).

Compendium of special pathology and therapy for veterinarians, E. Fröhner and W. Zwick, rev. by D. Wirth and W. Zwick (*Kompendium der Speziellen Pathologie und Therapie für Tierärzte. Stuttgart: Ferdinand Enke, 1938, 5. ed., rev., pp. XIV+428*).—A revised edition of this work (E. S. R., 68, p. 526).

A textbook of general bacteriology, E. W. Jordan, rev. by W. Burrows (*Philadelphia and London: W. B. Saunders Co., 1938, 12. ed., rev., pp. 808, figs.* [*196*]).—A new edition of this work (E. S. R., 74, p. 692) in which the chapter on virus diseases (pp. 614–652) has been most extensively revised. The introductory section has been rewritten and amplified to include collodion membranes and ultrafiltration, and a consideration of recent work on virus proteins, together with a new figure showing the relative sizes of virus particles.

[Work in animal pathology and parasitology by the Bureau of Animal Industry] (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1938, pp. 1, 2, 3–7, 36, 37, 38–42, 58–85*).—The work of the year (E. S. R., 79, p. 102) dealt with the detection and control of Bang's disease or brucellosis of cattle and swine; tuberculosis; mastitis; exanthematous diseases; fowl leukosis; hog cholera and its control; the use of disinfectants and anthelmintics and of tuberculin; eradication of scabies and dourine; inspection and quarantine of animals; infectious equine encephalomyelitis and related diseases; periodic ophthalmia; infectious anemia (swamp fever); swine erysipelas; anaplasmosis; the use of sodium bicarbonate for control of shipping fever; potency tests of rabies vaccine in rabbits; a virulent type of warts encountered in a dairy herd; comparative studies of actinobacillosis and actinomycosis; the use of embryo-propagated vaccines for fowl pox and laryngotracheitis; the testing of cattle for paratuberculosis by the use of intradermic and intravenous johnin; the diagnosis of paratuberculosis by the use of guinea pigs and rabbits; relation of stock-poisoning plants to bighead in sheep; hydrocyanic acid poisoning from sorghums; tick eradication; parasites of horses, ruminants, swine, and other animals; and treatment for the removal of parasites from poultry and swine.

[Control of diseases of livestock] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1938, pp. 138–140*).—The progress of control work with Bang's disease, bovine tuberculosis, and equine encephalomyelitis, and tracing tuberculosis and other diseases to their source are described.

[Work in animal pathology and parasitology by the Colorado Station] (*Colorado Sta. Rpt. 1938, pp. 39–41*).—A brief report is made of the work of the year (E. S. R., 78, p. 694) with plant poisoning, including that due to oat hay, *Suckleya suckleyana*, and onions, and suspected in silky *Sophora;* death losses of lambs; sheep losses in the feed lot due to sore mouth, coccidiosis, and intestinal parasites; sorehead of sheep; and equine encephalomyelitis.

[Work in animal pathology and parasitology by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1937–38, pp. 111–119*).—The work of the biennium for which results are reported (E. S. R., 78, p. 99) includes investigations of the H-ion concentration of the fluid content of the alimentary canal of the horse, equine encephalomyelitis, and the incidence, physiology, and chemotherapy of the Strongylidae of equines, by J. H. Whitlock, E. E. Leasure, C. H. Kitselman, C. C. Morrill, and W. W. Thompson; Bang's disease, by Kitselman; anaplasmosis and pinkeye (keratitis), both by H. Farley; avian tuberculosis, a *Trichomonas* parasite of poultry, selenium poisoning, anatomical studies of the respiratory tract of the chicken, and fowl paralysis, by L. D. Bushnell and M. J. Twiehaus; and parasites and resistance of chickens to parasitism, both by J. E. Ackert.

[Work in animal pathology by the Maryland Station] (*Maryland Sta. Rpt. 1938, pp. 35, 39–43, 43–45, 46, 47, 86, fig. 1*).—The work of the year reported upon includes control of infectious abortion in the station herd (E. S. R., 67, p. 742); udder infection with *Brucella abortus;* running fits (canine hysteria, fright disease) in dogs; diagnosis, treatment, and control of bovine pyelonephritis; treatment and control of infectious equine encephalomyelitis; field studies of periodic ophthalmia of horses and mules; streptococcic septicemia of horses and mules; diagnosis, treatment, control, and eradication of bovine trichomoniasis; diagnosis of trichinosis; diagnosis and control of bovine mastitis; water hemlock (*Cicuta maculata*) and other plants poisonous to livestock; blackhead (enterohepatitis) in turkeys; the effects of proteins on the internal organs of chickens; and a controlled test to determine the efficiency of approved good management in the control of bacillary white diarrhea.

[Report of work in animal pathology and bacteriology by the Michigan Station] (*Michigan Sta. [Bien.] Rpt. 1937–38, pp. 8, 9, 11, 14*).—The work of the biennium reported upon (E. S. R., 76, p. 689) includes control and eradication of Bang's disease, nonspecific abortions, calf pneumonia, methods of testing milk for the presence of the streptococci of mastitis, and necrotic enteritis in swine.

[Work in animal pathology by the Montana Station] (*Montana Sta. Rpt. 1937, pp. 37–40*).—Reference is made to work with mastitis, progressive pneumonia, infectious abortion, and intestinal parasites of sheep; arthritis and prevention of naval infection in lambs; dysentery or white scours of newborn lambs; control of Bang's disease in range cattle; and coccidiosis in cattle.

Bactericidal and antigenic qualities of the washings of blowfly maggots, R. Gwatkin and A. M. Fallis (*Canad. Jour. Res., 16 (1938), No. 12, Sect. D, pp. 343–352*).—Washings of mixtures of maggots of *Calliphora erythrocephala*, *C. latifrons*, *C. vomitoria nigribarda*, and *Cynomyia cadaverina*, and of *Calliphora erythrocephala* alone, showed bactericidal activity against *Staphylococcus aureus*, *Streptococcus mastitidis*, two strains of *Brucella abortus*, and *Bacillus typhosus* in vitro. Flies were successfully raised in the laboratory, but washings from their maggots became less active with each generation. The pH value of active samples was generally greater than that of poor samples. Attempts to increase activity by rendering poor washings alkaline were unsuccessful. Diluted washings showed some bactericidal power. Keeping quality of liquid samples was poorer than that of dried ones. Washings from meat in which maggots had been grown had a definite bactericidal value, while those from control samples of meat had none. A suspension of maggots ground after washing was also inactive. Addition of *B. abortus* to meat on which maggots were grown did not increase bactericidal activity against this organism. Filtration reduced bactericidal action and toxicity. Intraperitoneal injections were toxic to guinea pigs. An antimaggot rabbit serum had good complement-fixing power with an antigen of maggot washings. Intraperitoneal injections of diluted washings failed to protect guinea pigs against infection with *B. abortus*, but there was some delay in development of infection, as indicated by slower appearance of agglutinins in treated animals.

The antiproteolytic enzyme of Ascaris lumbricoides var. suis, J. H. Sang (*Parasitology, 30 (1938), No. 2, pp. 141–155, figs. 7*).—The author confirms earlier reports of the inhibitory effect of *Ascaris* extract on pepsin and trypsin. "The inhibitory effect is shown to be brought about by a combination of the antienzyme with the enzyme and not by any of the other possible causes. The extract is shown to have a proteolytic as well as an inhibitory action, and these two properties are shown to be due to one and the same substance. The term 'ascarase' is suggested for this substance. The ascarase is shown to be a readily diffusible substance of the order of a primary albumose, is precipitated by ammonium sulfate and 70 percent alcohol, is only slowly destroyed in acid but rapidly in alkali, and is not digested by trypsin. It combines with the greatest quantities of substrate at pH 5–7. Ascarase is found in the various tissues of the worm in the following order: Ovary, oesophagus, gut, body fluid, ovojector, lateral line, uterus, and cuticle. A similar order was found for the male." The effect of the ascarase on the host and its function in the worm are discussed.

The appearance of a filtrable form of Brucella abortus in media containing tuberculin [trans. title], W. Sarnowiec (*Compt. Rend. Soc. Biol. [Paris]*, *129 (1938), No. 25, pp. 129–132).*—The work reported reveals the occurrence of a form of *B. abortus* which passes Chamberland L-2 and L-3 candles when this organism is cultivated in the presence of tuberculin. Further, the filter passer possesses all the pathogenic, serological, and even biological properties of *B. abortus.*

Induced tissue resistance to Brucella abortus infection, E. J. Pullinger (*Jour. Path. and Bact., 47 (1938), No. 3, pp. 413–422, pls. 2*).—In the tests conducted simultaneous injection of *Bacterium monocytogenes* and *Brucella abortus* was found to increase the resistance of guinea pigs to *B. abortus.* This increase is transitory, disappearing in the course of 1 to 2 weeks, and is thought to be dependent upon the protective action of macrophages mobilized in lymphoid tissue in response to a stimulus exerted by *Bacterium monocytogenes.*

The toxicity of Br. abortus for mice, F. W. Priestley and A. D. McEwen (*Jour. Compar. Path. and Ther., 51 (1938), No. 4, pp. 282–289*).—The intraperitoneal inoculation of mice with suitable doses of *Brucella abortus* was found to result in death in from 1 to 4 days. There has been found to be a definite relationship between this toxicity for mice and virulence as judged by the ability to infect guinea pigs, virulent strains being more toxic.

Anti-Brucella serum: Guinea pig protection experiments, R. Gwatkin (*Canad. Jour. Res., 16 (1938), No. 12, Sect. D, pp. 353–360*).—In experiments conducted in continuation of the work noted (E. S. R., 72, p. 690), guinea pigs were protected against infection with *B. abortus* by intraperitoneal injections of fresh, unpreserved, antiabortus rabbit serum. In the first two experiments the serum-treated and control animals were exposed to infection by contact with infected guinea pigs, while in the third experiment they were exposed by instillation of the infecting organism into the eye. In the first experiment 60 percent of the controls and none of the treated animals were infected, and in the second, 80 percent of the controls and 20 percent of the treated animals. In the third, all of the treated animals were protected while all of the controls became infected. The former method, although less certain than the latter, is worthy of consideration in experiments of this type, as it permits infection to occur in a natural manner.

Mechanism of the action of sulfanilamide in brucellosis, H. Welch. (U. S. D. A.). (*Jour. Bact., 37 (1939), No. 1, pp. 109, 110*).—The author has found in cases of human brucellosis and in guinea pigs infected with *Brucella abortus* that treatment with sulfanilamide markedly increases phagocytosis of this organism. On the other hand, individuals infected with other diseases and normal guinea pigs treated with sulfanilamide show no change in their opsonocytophagic activity for *B. abortus.* The blood of normal human beings or normal guinea pigs, when treated in vitro with sulfanilamide, shows no change in opsonocytophagic activity when mixed with untreated *B. abortus* or with sulfanilamide-treated organisms.

"It has been possible in infected guinea pigs, treated with sulfanilamide, to demonstrate the absence of the drug in the blood at the time at which marked phagocytosis occurs, and, further, to transfer this marked phagocytic activity to normal guinea pig and human cells by suspending them in the serum of infected treated guinea pigs. Since the presence of sulfanilamide as such is not essential for the demonstration of marked phagocytosis in infected treated guinea pigs, it would appear that the effect of the drug is an indirect one. The marked phagocytic activity demonstrated with normal cells in the presence of sera from infected individuals treated with sulfanilamide is completely lost by the addition to such sera of small amounts of a concentrated filtrate of

B. abortus. It would appear that sulfanilamide acts indirectly on *Brucella* infections by increasing the opsonic power of the blood and thus neutralizing the effect of the endotoxin or aggressinlike substances produced by this organism allowing phagocytosis to take place. The fact that it was not possible to stimulate the opsonic power of the blood toward *Brucella* of uninfected human beings or guinea pigs by treatment with sulfanilamide would indicate that an infective or immunizing process must be in progress for the drug to stimulate phagocytosis in this disease."

A study of the hemorrhagic septicemia Pasteurellae, C. T. ROSENBUSCH and I. A. MERCHANT. (Iowa State Col.). (*Jour. Bact., 37 (1939), No. 1, pp. 69–89*).—Studies were made of two distinct types of *Pasteurella* organisms which differed in cultural, biochemic, serologic, and pathogenic characteristics. One type included typical strains usually associated with hemorrhagic septicemia; the other included atypical forms designated as *P. hemolytica* by Newsom and Cross (E. S. R., 67, p. 744). "The typical strains were divided into two rather distinct subgroups, and a third, less distinct one, on the basis of xylose, arabinose, and dulcitol fermentation and by agglutination reactions. Evidence presented invalidates the present zoologic species classification. The name *P. multocida* Kitt 1885, n. comb., which includes all typical strains, is suggested to take the place of all the host species names, which are now in common use. Two types of variability were encountered. The permanent variants were of 'R' and virulent 'M' types, with their intermediate forms. The temporary variants which were produced in many respects by environmental effects on cultural characteristics, mouse pathogenesis, and biochemic reactions, suggested possible cyclic changes in the organism; these changes may account for the variability of results obtained by many previous investigators."

A list of 30 references to the literature is included.

The diagnosis of streptococcus mastitis by cultural methods, S. J. EDWARDS (*Jour. Compar. Path. and Ther., 51 (1938), No. 4, pp. 250–263*).—An account is given of methods that have been devised to facilitate the bacteriological diagnosis of chronic streptococcus mastitis in quarter and composite milk samples. A comparison of the streptococcus contents of the whole milk, sediment, and gravity cream has led to the suggestion that a small quantity of gravity cream (0.01 ml) is satisfactory and may conveniently be used as seed material. "When compared with cultural examination in blood agar plates, direct incubation of samples for the detection of *Streptococcus agalactiae* did not give reliable results since nonspecific growths were frequently encountered. For the selective cultivation of *S. agalactiae*, however, a glucose broth medium containing crystal violet (1/1,000,000) and sodium azide (1/10,000) was successfully employed and proved more convenient for routine use than the plating method. A procedure based on the application of this method and designed to facilitate the working of a scheme for the control of chronic mastitis is outlined."

Sulfanilamide in the treatment of streptococcic mastitis, E. M. GILDOW, D. L. FOURT, and A. O. SHAW. (Idaho Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 12, pp. 759–766, figs. 2*).—Following a review of the literature in connection with a list of nine titles, report is made of a study, commenced in June 1937, in which the dose interval to maintain blood level, blood level in relation to dose, the effectiveness of sulfanilamide in the treatment of streptococcic mastitis, and the toxicity of sulfanilamide were investigated.

"The blood and milk levels of unconjugated sulfanilamide in cattle were maintained over a period of 12 hr. either following an initial dose or after the last dose of a period of treatment. This insures a reasonably constant level of sulfanilamide in the blood of cows that are dosed twice daily at 12-hr. intervals. It was possible to attain a level of sulfanilamide in blood and milk slightly under 8 mg per 100 cc only when the dose was approximately 10 g per 100 lb. body weight, or twice that recommended for man. Blood levels slightly less than 2 mg per 100 cc were attained with a dose comparable with that recommended for man, that is, 5 g per 100 lb. body weight daily. Both of these levels are below that of 10 mg per 100 cc of blood suggested for favorable results in man. Doses of 5, 10, or even 15 g per 100 lb. body weight over a period of 3 to 10 days failed to permanently eliminate β-hemolytic streptococci from the udders of cows affected with streptococcic mastitis, regardless of whether the cases were acute or chronic or of short or long duration. Even recently affected nonclinical cases were not freed of the organism. Symptoms of acute streptococcic mastitis such as tenderness, swelling, [and] hardness of the quarter, accompanied by flaky, pussy, or watery milk were relieved in most cases by administering sulfanilamide in doses of 5 to 10 g per 100 lb. body weight for 7 to 10 days. Five g per 100 lb. body weight seemed to be as effective as larger doses in relieving clinical symptoms of acute mastitis. The cases treated had failed to respond satisfactorily to the standard treatment of applying hot packs, frequent milkings, massages, laxatives, and udder ointments.

"Sulfanilamide poisoning in the form of sluggishness, loss of appetite, reduced milk flow, roughened coat, fever, and increased pulse and respiration were produced in 1 to 3 days when the total daily dose was 15 g per 100 lb. body weight. Five g per 100 lb. body weight had little or no detrimental effect in 9 of 11 cows treated. The dose should be reduced or eliminated when toxic symptoms appear. One cow died following doses of 10 and 15 g per 100 lb. body weight with enteritis diarrhea and definite cyanosis of the musculature. Another cow showed extensive eczema when allowed contact with the direct rays of the sun during treatment with 10 and later 5 g per 100 lb. body weight. There seems to be an individual difference in tolerance of cows to sulfanilamide."

In the course of the work 16 cows were treated for streptococcic mastitis with sulfanilamide. "Eight of 9 cases with an initial infection showing acute symptoms gave favorable results with a reduction of inflammation of the udder and restoration of normal-appearing milk. One cow showed symptoms of toxic poisoning, and treatment was discontinued. Favorable results were obtained in 6 out of 9 severely affected quarters in 4 old chronic cases. The 3 additional quarters were greatly improved. No improvement was shown in 3 cases of initial infection where clinical symptoms had not developed."

Therapeutic effect of 4, 4′-diamino-diphenyl-sulfone, corresponding sulfide and acetyl derivatives in streptococcic infection, G. W. RAIZISS, M. SEVERAC, J. C. MOETSCH, and L. W. CLEMENCE (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 2, pp. 339–344*).—The work reported has led to the following conclusions: "(1) 4,4′-diamino-diphenyl sulfone is about 3 times as toxic for the rabbit as is sulfanilamide; 4,4′-diamino-diphenyl sulfide is 5 times as toxic. (2) The corresponding diacetyl derivatives of sulfone and sulfide are less toxic than sulfanilamide. (3) The minimum therapeutic doses given daily for 5 consecutive days are as follows: For sulfanilamide 0.005 g, for 4,4′-diamino-diphenyl sulfone 0.0005 g, for diamino-diphenyl sulfide 0.003 g, for di(acetyl-amino-)-diphenyl sulfone 0.001 g, and for di(acetylamino)-diphenyl sulfide 0.002 g. (4) In mice infected with *β-Streptococcus hemolyticus*, 4,4′-diamino-diphenyl sulfone is therapeutically active in a dose 10 times smaller than that required by sulfanilamide. This indicates a considerably higher therapeutic efficacy of the sulfone over sulfanilamide."

Cultivation of Trichomonas foetus in the chick embryo, P. M. Nelson. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 2, pp. 258, 259*).—In the work reported *T. foetus* was grown successfully in chick embryos through 14 generations when the parasites were inoculated beneath the chorioallantoic membrane as described.

A study upon passive immunity in experimental trichiniasis, J. T. Culbertson and S. S. Kaplan (*Parasitology, 30 (1938), No. 2, pp. 156–166*).—It is concluded from the studies reported that protection against infection with *Trichinella spiralis* is conferred upon mice by the passage transfer to them of a specific immune serum from rabbits. "A smaller percentage of mice treated with the immune serum die, and fewer larvae invade the muscles of the treated mice than among control animals. The action of the antibody of the immune serum appears to be directed specifically against the ingested larvae which are maturing to adult worms in the intestine of the infected animals. The results obtained thus far indicate that an immune serum would have little therapeutic value in the later stages of the disease."

Studies in animal trypanosomiases.—V, Some disturbances of the host's carbohydrate metabolism induced by Trypanosoma congolense and Trypanosoma brucei, M. H. French (*Jour. Compar. Path. and Ther., 51 (1938), No. 4, pp. 269–281*).—A continuation of the studies noted (E. S. R., 80, p. 395).

Actinomycosis, Z. Cope (*London and New York: Oxford Univ. Press, 1938, pp. XII+248, pls. 8, figs. 52; rev. in Vet. Rec., 50 (1938), No. 42, pp. 1409*).—This is a monographic account of actinomycosis presented in 19 chapters, with a bibliography of 25 pages. The form of *Actinomyces* responsible for most cases in man is the same as that which causes the disease in cattle, namely, the ray fungus *A. bovis*. Attention is called to the important finding of Lignières and Spitz in 1902 (E. S. R., 14, p. 498) that the common so-called "wooden tongue" of cattle is not due to the ray fungus but to the Gram-negative bacillus *Actinobacillus lignieresi*, as are some cases of lumpy jaw.

Bang's disease studies: The influence upon breeding efficiency of Bang's disease reacting cows by artificial inoculations with Brucella abortus, F. M. Bolin (*North Dakota Sta. Bimo. Bul., 1 (1938), No. 2, p. 19*).—Information obtained in the course of work with Bang's disease in a reacting herd of cows is briefly reported. Inoculations of cows reacting to *B. abortus* tests during the open periods were found to lengthen the time before conception was obtained, and a greater number of services were required per conception when compared with those animals not inoculated during the open period. "Bang's reacting cows inoculated with *B. abortus* during the gestation period produced 10 dead calves as against 36 live calves. On a percentage basis these were divided quite evenly between those inoculated and those not inoculated during the preceding open period, also the percentage of retained fetal membranes was about the same in the two groups. Inoculation or lack of inoculation during the open period apparently had no effect upon the following gestation period. This experiment indicates that there is no absolute immunity in Bang's disease. The results obtained indicate that the immunity present is of short duration."

A preliminary note on the experimental reproduction of bovine pleuropneumonia, A. D. Campbell (*Jour. Council Sci. and Indus. Res. [Austral.], 11 (1938), No. 2, pp. 103–111, fig. 1*).—Experiments reported show that typical contagious bovine pleuropneumonia can readily be produced in susceptible cattle either by exposing them to highly atomized culture or by introducing culture into a small bronchus by means of a catheter. "For dealing with large numbers of animals the atomization technic is preferable. The experimentally produced disease is in all respects identical with the naturally occurring disease and is infectious to susceptible cattle. As the remaining postulate of Koch has now been fulfilled, Nocard and Roux's organism can be regarded definitely as the cause of the disease. These findings give us a method for testing induced resistance which is regarded as superior to subcutaneous inoculation of cultures."

Contagious bovine pleuro-pneumonia.—A report on the use of new antigens for the complement-fixation and agglutination tests, A. D. Campbell (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *11* (*1938*), *No. 2, pp. 112–118, fig. 1*).—A description is given of the preparation of a new antigen for the diagnosis of bovine pleuropneumonia by the complement-fixation test. "The new culture antigen replaces the original Ebert and Peretz antigen formerly used by us. It is easier to prepare, is more constant in its properties, and has a higher antigenic value and sensitivity. Cattle exposed to atomized culture react between the sixth and tenth day, and when acutely affected may give complete fixation in dilutions as high as 1 in 20,480. Chronically affected beasts are readily detected."

A description is also given for the preparation of a new antigen for the agglutination test, which test is, however, far less sensitive than the complement-fixation test even during the clinical phase. It is negative in chronically affected animals, and thus is of little value.

Contagious bovine pleuro-pneumonia.—A preliminary note on immunity, A. D. Campbell (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *11* (*1938*), *No. 2, pp. 119–126, figs. 2*).—The results obtained from vaccination in the control of pleuropneumonia in northern Australia strongly suggest that if a high and lasting immunity is to be maintained, the animals should be vaccinated with a strain of the organism possessing a relatively high degree of virulence. "Immunity is maintained for more than 12 mo. when a virulent strain is used for vaccination, whereas if a comparatively avirulent strain is used immunity begins to wane after 2 mo. There is no apparent significant difference in the immunity of single- and double-vaccinated cattle when exposed at an interval of 12 mo. after vaccination." The reactions of 51,000 head of cattle vaccinated in the field are discussed.

Incidence of Trichomonas foetus infection in Iowa, S. H. McNutt, F. Blohm, and J. A. Barger. (Iowa State Col. and U. S. D. A.). (*Vet. Med.*, *34* (*1939*), *No. 1, pp. 40–42, fig. 1*).—Examinations made of cows and heifers at the time of slaughter at a central Iowa meat packing establishment, together with examinations of herds throughout central Iowa during the past 6 yr., indicate that trichomoniasis due to *T. foetus* occurs in not more than 0.5 percent of the herds. Six infected herds have been found in Iowa, of which four are now known to be free, but no information is available on the present status of the other two. This organism was not found in hogs. A list is given of 23 references to the literature cited.

Transmission of bovine venereal trichomoniasis through artificial insemination, G. G. Garlick. (U. S. D. A.). (*Vet. Med.*, *34* (*1939*), *No. 1, pp. 43, 44*).—The data here presented show that in two cases *Trichomonas foetus* was probably transmitted by artificial insemination.

"White scour" in calves and related infections.—I, The significance of the vitamin A content of the colostrum as a predisposing factor in the causation of such conditions, J. Stewart and J. W. McCallum (*Jour. Compar. Path. and Ther.*, *51* (*1938*), *No. 4, pp. 290–295*).—Statistically significant results from experiments carried out on a calf population of 206 have shown that calves born of mothers whose colostrum possessed a vitamin A content of less than 250 blue units (Moore's) per 100 ml were more liable to infections such as white scour, navel ill, and joint ill than were calves from mothers whose colostrum had a vitamin A content of more than 250 blue units per 100 ml.

An alum-precipitated toxoid as an immunizing agent against infectious necrotic hepatitis (black disease) in sheep, E. A. Tunnicliff and H. Marsh. (Mont. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 2, pp. 98–110*).—The studies reported, the details of which are given in 10 tables, have shown the disease of sheep known in Australia as infectious necrotic hepatitis, or black disease, to occur in western Montana, principally in farm flocks. The affection is manifested by sudden deaths from toxemia produced by the activity of *Clostridium oedematiens* in the liver following invasion of immature flukes. Work carried on simultaneously with similar investigations in Australia resulted in the development of an alum-precipitated toxoid prepared from a highly toxic strain of *C. oedematiens*, the use of which prevents this disease in the infected areas. A list is given of 12 references to the literature cited.

Clostridium welchii: Notes on the relationship between the types of cultures and the production of toxin, T. Dalling and H. E. Ross (*Jour Compar. Path. and Ther., 51 (1938), No. 4, pp. 235–249*).—A digest of the literature, presented with a list of 28 references, led to the conclusion that the several types of *C. welchii* produce toxins by which they may be classified. "Cultures vary considerably in their capacity to produce the different toxins. Certain methods encourage the production of the different types of toxin. Typing of an organism of any group cannot be said to be completed till all the methods for the production of the different types of toxin have been carried out, and until all the known tests, direct and indirect, have been applied. In cases of clinical lamb dysentery different types of *C. welchii* may be found at different levels of the intestine, the tendency being for the D type to occur in the more proximal part of the intestine. In the protection of sheep and lambs against an infection shown to be associated with the *C. welchii* group, prophylaxis against all types of toxin should be carried out unless careful tests have shown that only a certain type of organism is causing the infection."

Variation in numbers of coccidia in lambs during the feeding season, A. W. Deem and F. Thorp, Jr. (Colo. Expt. Sta.). (*Vet. Med., 34 (1939), No. 1, pp. 46, 47, fig. 1*).—In examinations made of three lots of lambs in 1937–38 it was found that there was a gradual rise in number of coccidia for at least 1 or 2 weeks, after which time the number of coccidia became stationary for a period of about 3 weeks, following which a fairly rapid decline was observed. The groups of lambs under observation were grazed during the day and were not closely confined at night. It appears that the first month constitutes the period during which coccidiosis may develop, and that even in the lambs that were kept under ideal conditions coccidia became sufficiently numerous to approach the danger point. In all those lots in which coccidiosis developed the lambs were closely confined and some were improperly bedded, while a majority of them were being fed a heavy ration during this period.

Sterile culture of the free-living stages of the sheep stomach worm Haemonchus contortus, R. W. Glaser and N. R. Stoll (*Parasitology, 30 (1938), No. 3, pp. 324–332, figs. 3*).—A study of the effect of an efficient bactericidal solution on the hatching of *Haemonchus* eggs, in which it was found that a large portion remained viable, is reported. Infection tests proved that *Haemonchus* larvae grown under conditions of sterility were normally infective for, and produced normal adults in, a susceptible lamb.

Studies on the physiology of the nematodes of the alimentary canal of sheep, D. G. Davey (*Parasitology, 30 (1938), No. 3, pp. 278–295, fig. 1*).—It was found that cellulose digestion had apparently no effect on the nematodes from the alimentary canal of sheep, that they could not live in the abomasum because the acidity is too great, and that *Ostertagia circumcincta* could not inhabit the stomach of horses and carnivores, or the abomasum of cattle, since the acidity reaches a level lethal to this species.

Sheep vermicide: A stabilized concentrate, E. R. CARLSON. (Wis. Expt. Sta.). (*Vet. Med., 34 (1939), No. 1, pp. 48, 49*).—A method for preparing a stabilized concentrate of copper sulfate and nicotine sulfate with the use of the protective colloid gum arabic is described. It is pointed out that the stability of the solution assures accurate dose potency. No precipitation occurs either in the concentrate or in the prepared drenching fluid. The stabilized concentrate can be stored or easily transported, and by diluting it as described the preparation of the proper amount of drenching fluid for the flock is facilitated.

Drug poisons for sheep parasites, J. H. RIETZ (*West Virginia Sta. Bul. 290 (1938), p. 6*).—Brief mention is made of the effectiveness of copper sulfate when used against internal parasites of sheep.

Rinderpest in African game, J. CARMICHAEL (*Jour. Compar. Path. and Ther., 51 (1938), No. 4, pp. 264–268*).—A report of observations of rinderpest in game animals in Uganda.

Cottonseed poisoning of pigs, H. R. BINNS (*Jour. Compar. Path. and Ther., 51 (1938), No. 4, pp. 296–304*).—Report is made of an outbreak of cottonseed poisoning which took place in a herd in the southern province of Nyasaland. "Cottonseed to the amount of about 25 percent of the total ration fed for 2 weeks caused peracute fatal poisoning during the fifth week after the commencement of feeding of 14 out of a total of 23 pigs aged 4 to 6 mo. Generally speaking, the younger pigs died earlier than the older ones. Of 8 adult pigs 1 vomited and 2 showed anorexia, vomiting, and diarrhea. The symptoms and lesions observed in the outbreak are described. It is concluded that cases of poisoning essentially similar to those caused by cottonseed cakes and meal are produced by unaltered cottonseed, and that the toxic agent is therefore present in the raw seed. The ration fed to the affected herd was deficient in protein and minerals. It is suggested that the very severe effects produced by a comparatively small amount of cottonseed support the view that there exists a relation between susceptibility to cottonseed poisoning and nutritional deficiency, particularly a deficiency of protein, iron, and calcium."

Brucella infection in swine, S. H. MCNUTT. (Iowa State Col.). (*Vet. Med., 34 (1939), No. 1, p. 9*).—An abstract of a contribution presented at the annual meeting of the U. S. Livestock Sanitary Association held in Chicago, Ill., November 30, 1938.

Recent developments in equine encephalomyelitis, H. W. SCHOENING. (U. S. D. A.). (*Vet. Med., 34 (1939), No. 2, pp. 84–89, figs. 4*).—A review is given of the appearance of this disease of the horse in the United States, where in 1938, 9 new States reported its occurrence for the first time. About 100,000 cases were known to have appeared during the year in 39 States reporting.

Diseases and parasites of poultry, E. H. BARGER and L. E. CARD (*Philadelphia: Lea & Febiger, [1938], 2. ed., rev., pp. 386, [pl. 1], figs. 80*).—A thoroughly revised edition of this work (E. S. R., 74, p. 105).

Wheat germ oil in the control of fowl paralysis and kindred diseases, E. JUNGHERR. ([Conn.] Storrs Expt. Sta.). (*Vet. Med., 34 (1939), No. 1, p. 8*).—An abstract of a contribution presented at the annual meeting of the U. S. Livestock Sanitary Association held in Chicago, Ill., November 30, 1938.

Eighteenth annual report on eradication of pullorum disease in Massachusetts, H. VAN ROEKEL ET AL. (*Massachusetts Sta. Control Ser. Bul. 93 (1938), pp. 11*).—In continuation during 1937–38 of the control work with pullorum disease (E. S. R., 78, p. 703), a steady progress was made in its eradication. There was a marked increase over the previous season in the number tested, 480,227 birds in 308 flocks, of which 0.17 percent reacted, indicating infection, as compared with 448,519 birds in 307 flocks tested the preceding year with 0.37 percent reactors.

An outbreak of infectious roup in young chickens, H. S. Purchase (*Vet. Rec., 51 (1939), No. 1, pp. 3–16, figs. 5*).—An investigation of roup affecting young chickens revealed that the period of incubation was from 4 to 12 days. "There was no definite temperature reaction shown during the course of the disease. The symptoms were severe catarrh of the respiratory tract, lachrymation, conjunctivitis, diarrhea, and emaciation. The lesions were observed in the eyes, nostrils, mouth, and small intestines. There was also often a membranous deposit in the mouth and pharynx. There was a decided age immunity, and the mortality in young chicks was high. The etiological factor was primarily a virus capable of passing through a Seitz bacterial filter and Chamberland L–2 candle. There was often present a secondary organism having morphological and staining properties resembling *P[asteurella] avicida* but less virulent for fowls. The disease could be set up by contact, feeding, and inoculation. Roup could clinically be differentiated from fowl pox and gapes."

Histomonas meleagridis in domestic fowls (Gallus gallus): Cultivation and experimental infection, A. Bishop (*Parasitology, 30 (1938), No. 2, pp. 181–194, pl. 1*).—In the studies reported *H. meleagridis*, the causative agent of blackhead (enterohepatitis), was isolated in culture from the liver lesions of a hen suffering from the affection and was cultivated at 36.5°–37° C. for over a year. "Chicks, which had been reared free from protozoa, were inoculated per os or per anum with cultures of the above strain of *H. meleagridis*. Eleven out of 12 birds became infected. Cecal lesions only were produced. This strain, although isolated from the liver lesions of a hen suffering from acute blackhead, showed no abnormal virulence in chicks. Individuals of this strain of *H. meleagridis* showed amoeboid movement but were also flagellate. Normally the protozoon was uninucleate, but binucleate forms were common and tri- and quadrinucleate forms occurred more rarely. One flagellum arose from each nucleus. During division the flagellum disappears. The method of nuclear division was similar to that of *Trichomonas*. A resistant phase was never seen in the cultures." A list is given of 27 references to the literature.

Paratyphoid infection of turkeys, B. S. Pomeroy and R. Fenstermacher. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 2, pp. 90–97*).—In studies commenced in Minnesota in 1935, it has been found that *Salmonella aertrycke* may produce an acute disease of young poults up to 5 weeks of age. This organism was isolated from infertile eggs and dead-in-the-shell embryos during the second, third, and fourth week of incubation and from the ovary and oviduct of 3 of 10 naturally infected birds. It was shown that in addition to *S. aertrycke, S. anatum, S. newington, S. montevideo, S. derby, S. senftenberg, S. bareilly*, and *S. bredeney* may produce losses among baby poults.

Notes on the cestode parasites of English sparrows in Indiana, K. E. Kintner. (Purdue Univ.). (*Parasitology, 30 (1938), No. 3, pp. 347–357, figs. 13*).—In an examination for cestode parasites of 197 English sparrows collected in the vicinity of LaFayette, Ind., the species recovered and incidences of infestation were *Hymenolepis passeris* (Gmelin) 2.5 percent, *Choanotaenia passerina* (Fuhr.) *provis* 3.5, and *Anonchotaenia globata* (von Linstow) 2.5 percent. *H. passeris* is reported for the first time from North America.

AGRICULTURAL ENGINEERING

[Agricultural engineering research of the U. S. Department of Agriculture] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1938, pp. 78–81, 119–124. 131–133, 156–160*).—This report of the Secretary briefly describes demonstration work which has resulted in the voluntary adoption by farmers of practices effective in reducing soil and water losses and flood hazards in the Coon Creek (Wis.) watershed area. Other brief notes cover advances in irrigation practice; farm storage findings; fertilizer placement, tillage machinery, pest control (including successful tests of a vapor spreader similar in principle to steam cleaners for buildings), and improved cotton pickers; dryers, cleaners, and extractors for cotton; irrigation farming problems; and changing highway needs, including a brief discussion of future requirements and the desirability of uniform traffic laws adequately enforced.

Report of the Chief of the Bureau of Agricultural Engineering, 1938, S. H. McCrory (*U. S. Dept. Agr., Bur. Agr. Engin. Rpt., 1938, pp. 26*).—Data from the Division of Farm Structures are given on farm building insulation; farm storage of potatoes, corn, and other commodities; refrigerator car studies; pressure of silage crops; and orchard heating. The Division of Drainage gives data on hydraulic studies, run-off investigations, drainage of timberlands, durability of drain tile, effect of silage acids on concrete silos, irrigation of strawberries, drainage of sugarcane lands, water control in peat and muck soils of Florida, C. C. C. drainage camps, maintenance of drainage channels, and flow of water in drainage channels. The Division of Irrigation notes studies on irrigation of subtropical fruit and pears, duty of water, evaporation, and snow surveys and irrigation water supply forecasting. The Division of Mechanical Equipment reports upon fertilizer-distributing, corn production, sugar beet production, and cotton production machinery; moldboard-plow bottoms and disk-harrow blades; harvesting and drying pyrethrum; harvesting sweetpotatoes for starch; corn-borer control equipment; and the mechanical harvesting of cotton. The cotton ginning investigations of the Bureau have included work on simplification of gins, new developments in cotton driers, fan and piping tests, and gin capacity studies. The report also contains brief statements concerning farm operating efficiency investigations.

[Agricultural engineering studies by the Arkansas Station] (*Arkansas Sta. Bul. 368 (1938), pp. 13–17, 61, figs. 2*).—Data on supply, requirement, and rainfall contribution in the irrigation of rice, by D. G. Carter and K. Engler; on physical and economic inputs for field power by tractors, by W. C. Hulburt and O. J. Hall; on farm building construction costs, by Carter; and on the influence of poultry housing on egg production, by Carter, R. M. Smith, and W. H. Wiley, are stated briefly and discussed.

[Agricultural engineering studies by the Colorado Station] (*Colorado Sta. Rpt. 1938, pp. 22, 23, 36, 37*).—The mechanical engineering section (coop. U. S. D. A.) reports on sugar beet machinery, including tests showing improved results (as compared with placing the fertilizer with the seed or broadcasting it) when the fertilizer was mechanically placed below and close to the seed; easier irrigation of ridge-planted beets as compared with flat-planted beets, with no difference in yield between the two methods; tests showing from 16 to 40 percent better germination following the disk opener as compared with the shoe-type opener; and very promising trials of a single seed-ball planter. The irrigation investigations section reports upon an adjustable tube orifice meter; a new summation recorder for acre-feet which indicates also the stage in feet and corresponding second-feet discharge when used in conjunction with a Parshall measuring flume, stable rating flume, or free-flow weir; study of a vortex tube sand trap; and work on a new sand trap.

[Agricultural engineering investigations by the Michigan Station] (*Michigan Sta. [Bien.] Rpt. 1937–38, pp. 6, 7*).—This report notes a 1937 survey to determine the number (about 1,000) of combines in use in Michigan, tests showing the superiority on wet muck soils of spade lug grip low-pressure pneumatic tires over steel wheel lugs, marked superiority with respect to mechanical injury of box or crate storage of potatoes over bin storage (coop. U. S. D. A.), advantages of laminated rafter construction, and studies of porous hose and sprinkler head irrigation methods.

[Agricultural engineering research by the Montana Station] (*Montana Sta. Rpt. 1937, pp. 34–36*).—Work on methods of irrigating seed and canning peas, and range improvement by water conservation is noted.

Elements of water supply engineering, E. L. WATERMAN (*New York: John Wiley & Sons; London: Chapman & Hall, 1938, 2. ed., rev., pp. XVII+329, figs. 82*).—This is a textbook for students beginning the study of water-supply engineering, intended to cover the fundamentals without being too long for thorough study in the time usually given this subject in the civil engineering curriculum. In the present revision, the author has added new material concerned with mechanical equipment for water-treatment plants, the use of activated carbon for the control of tastes and odors in water supplies, the Hardy Cross method of analyzing the flow in distribution pipe networks, and the Proctor method for the design and construction of rolled-fill earthen dams. The contents include requirements of municipal water supplies, quantity of water required, quality requirements, examinations of water to determine its quality, sources of water supply, precipitation, ground waters, the collection of ground waters, stream flow, impounding reservoirs, river and lake intakes, transportation of water, pumps and pumping plants, the treatment of water, rapid sand filtration, the removal of dissolved impurities, chlorination of water, distribution systems, distribution storage, structural features of the distribution system, operation and maintenance of waterworks systems, and waterworks finance.

Water levels and artesian pressure in observation wells in the United States in 1937, O. E. MEINZER and L. K. WENZEL (*U. S. Geol. Survey, Water-Supply Paper 840 (1938), pp. IV+657, figs. 20*).—This report is the third of the series on ground water levels and artesian pressure (E. S. R., 78, p. 403).

Daily river stages at river gage stations on the principal rivers of the United States, compiled by M. BERNARD (*U. S. Dept. Agr., Weather Bur., Daily River Stages, 34 (1936), pp. III+164*).—This volume contains data for 1936 (E. S. R., 77, p. 256).

Irrigation: A selected bibliography, compiled by D. W. GRAF (*U. S. Dept. Agr., Bur. Agr. Engin., 1938, pp. [1]+631*).—The material is grouped under numerous subject headings alphabetically arranged and, in a second or geographical section, under miscellaneous place names including States of the United States and some similar territorial units, State groups, foreign countries, etc. The compiler has attempted to keep together references to original publications and subsequent reprints, abstracts, or discussions of the original publications. References to books, periodicals, and society publications through 1937 are included.

Engineering properties of soil, C. A. HOGENTOGLER, in collab. with H. AARON, R. C. THOREEN, E. A. WILLIS, and A. M. WINTERMYER, edited by C. A. HOGENTOGLER, JR. (*New York and London: McGraw-Hill Book Co., 1937, pp. XIII+434, figs. 198*).—The authors state that as results of road soil research became available, requests for instruction in fundamentals were met by the U. S. D. A. Bureau of Public Roads in courses given at the Bureau's subgrade-soil testing laboratory with the use of published reports of the Bureau and of cooperating agencies. This material has gradually "assumed a definite and more or less stable form, so that it can now be embodied in a textbook. . . .

"General information on the properties of soil in relation to the design and construction of engineering work and general descriptions and the significances of the methods used in soil examination and the utilization of test results in the design of stable, durable, and economic structures are included. This material is arranged for the use of instructors in engineering materials, engineering students, and practicing engineers who desire a very general but complete conception of the physical characteristics of soils and their influence on the performance of soil as an engineering material, and also the engineer and road builder who require an intimate and comprehensive knowledge of the engineering properties of soil and tests for disclosing them." Soil dynamics research in progress for about 20 yr. at the Alabama Experiment Station is not mentioned, however.

Part 1 deals with the origin and composition of soil, soil constituents, soil mixtures, and natural soil formations; part 2, the characteristics of soil, colloidal surface phenomena, the character of soil moisture, movements of soil moisture, the frost phenomena; part 3, the structural properties of soil, the pressure bulb, settlement due to compression, and shear strength and stability; and part 4, the practical design and construction, classification of soils for engineering purposes, design of graded mixtures, stabilization of fine-grained soils, construction of stabilized-soil roads, soft foundation soils, properties and performance of typical soils, and miscellaneous properties and tests. There are also in appendixes (1) conversion tables, (2) nomenclature, (3) glossary of geological terms, and (4) terms identifying soils in the profile; a bibliography; and a general index.

Report of the Chief of the Bureau of Public Roads, 1938, T. H. MacDonald (*U. S. Dept. Agr., Bur. Pub. Roads Rpt., 1938, pp. 72*).—Among numerous topics taken up in this report are modernization of the Federal-aid system, principal needs on main roads, construction of secondary (farm-to-market) roads, highway safety, and physical research, including subsurface exploration, and an erosion test for culvert pipe.

Diesel tractor engines, A. C. Jacquot (*Washington Sta. Pop. Bul. 156 (1939), pp. 28, figs. 13*).—This is a largely nontechnical description of the four-stroke-cycle Diesel engine, the types taken up in detail being, respectively, that which is turned over and preheated by an auxiliary small two-cylinder gasoline engine, that provided with a burner-heated coil in the cooling water circuit and started by an electric starting motor, and the type provided with built-in auxiliary combustion chambers and spark plugs for initial rotation and heating by gasoline operation. Comparison of the Diesel cycle with the Otto cycle of the ordinary gasoline engine is made by means of parallel columns of diagrams, a valve-timing diagram for the Diesel engine is included, temperature-pressure relationships during Diesel and Otto cycles are shown, and other features of design and operation are also illustrated. An oil-burning engine similar to the Diesel except in using spark ignition with lower compression (the so-called semi-Diesel) is very briefly noted.

In conclusion it is noted that the Diesel uses considerably less fuel, and a lower priced fuel, than does the gasoline engine and possesses better "lugging ability" at peak load (a capacity which often leads to excessive overloading with concomitantly rapid wear). Those who have successfully used gasoline tractors have no difficulty in operating Diesel tractors. On the other hand, maintenance, due to higher cost of replacement parts, is more expensive than that of gasoline tractors, and the initial cost is higher. "It is evident that the size of the farm or the total number of hours that the tractor is operated each year becomes a deciding factor in the selection of the most economical type of tractor for the requirements of a given farm."

Nebraska tractor tests, 1920–1938 (*Nebraska Sta. Bul. 321 (1939), pp. 45, fig. 1*).—This bulletin summarizes the results of 101 of the 304 tractor tests conducted since 1920 and includes data on all tractors reported as on the market January 1, 1939.

Farm machinery, C. Culpin (*London: Crosby Lockwood & Son, 1938, pp. 405, figs. 199*).—This book was planned as a source of information for farmers and agricultural students concerning the construction, maintenance, and use of farm-power sources, implements, and machines and the economics of mechanization. It has been the author's purpose to deal with broad principles more than with details which might quickly be out of date. It is not intended to be a complete treatise on agricultural engineering, but it contains much information concerning agricultural engineering developments and practices up to 1937 observed by the author in countries other than his own.

[Damming attachment for listers], L. C. Aicher and T. B. Stinson (*Kansas Sta. Bien. Rpt. 1937–38, pp. 127, 128, 131*).—Results of tests are briefly noted.

Mechanizing the corn harvest, C. K. Shedd and E. V. Collins. (Coop. Iowa Expt. Sta.). (*U. S. Dept. Agr., Farmers' Bul. 1816 (1938), pp. II+13, figs. 7*).—This briefly discusses the development of harvesting and husking machines from the rather ineffective single-row type of 1904, horse-drawn and ground-driven and often capable of no more harvesting per man than could be done by hand, to the recently marketed 2-row tractor powered machines of greatly improved efficiency, safety, and convenience; field losses and other operating characteristics; and the time-saving device of a telescoping wagon tongue. Improvement in performance can be obtained by growing a corn hybrid well adapted to machine picking, by picking before the crop is dry and brittle or has suffered fall-storm damage, and by avoiding so wide an opening in the adjustment of the snapping rollers as to cause excessive shelled-corn loss. Where the growing equipment is so far mechanized as to permit from 100 to 150 acres per man to be grown, mechanical picking is considered more efficient than hand husking. The frequency of accidental injuries from corn pickers is noted, together with the precautions needed to prevent such accidents.

Experiment in grain storage, H. F. McColly. (Coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul., 1 (1938), No. 2, pp. 6, 7*).—The author very briefly outlines experiments in progress on farm storage of grain.

Grain storage on the farm (*Maryland Sta. Rpt. 1938, p. 21*).—The station reports a 2-yr. study which indicated that, whereas wheat containing 15 percent of moisture may be stored for a short time, the use of an artificial drier will generally be necessary before long-period storage of wheat of 14 percent or greater moisture content.

Electricity for curing and storing sweet potatoes.—Progress report on two seasons' observations in sweet potato storage houses of capacities varying from 500 to 2,000 bushels, J. A. Schaller and B. D. Drain (*Tennessee Sta. Circ. 63 (1938), pp. 4, figs. 8*).—A strip heater of 1,000-w. consumption is mounted across the opening in the top of a metal box over each floor ventilator. The false flooring of slats is raised on 2×8 stringers to a height of 8 in. above the solid floor, and 500-w. heaters, from which the floors and stringers are protected by asbestos paper, are distributed evenly under the false flooring, a sheet-metal baffle over each heater serving to prevent local overheating during the curing period. Constructional details are adequately indicated in a floor plan diagram and photographs. Advantages over the use of stoves include an increase in storage capacity and the provision of uniform temperatures (maximum variation of about 2° F. between floor and ceiling of a 2,000-bu. storage), which may greatly improve the quality of the product so cured. The power consumption was found to be about 1 kw.-hr. per bushel. The operating costs are estimated as from 2 to 6 ct. per bushel, varying with local power rates, type of construction, and percentage of the storage capacity actually filled.

Overhead cleaner-drying systems for seed cotton, C. A. Bennett and C. S. Shaw (*U. S. Dept. Agr., Misc. Pub. 314 (1938), pp. 20, figs. 18*).—From 5 years' tests at the U. S. D. A. cotton ginning laboratories on equipment for from 1- to 3-stand gins, the authors conclude that seed cotton can be dried effectively and economically by introducing heated air either into the suction line entering an overhead air-line cleaner or into an overhead out-of-the-air cleaner. The air-line cleaner-drier within certain limitations has proved satisfactory under test and meets the requirements of the Government process. It and some of the methods of applying hot air to out-of-the-air cleaners are described.

Diagrams of the various forms of cleaner-drier here discussed are included, together with dimensioned drawings of iron pipe air heaters and photographic cuts showing home-made and commercial setups and parts of installations.

Air conditioning, C. A. Fuller, in collab. with D. Snow (*New York: Norman W. Henley Pub. Co., 1938, pp. IX+577, [pls. 2], figs. [239]*).—This book has been designed to furnish a complete practical guide for the calculation, design, installation, and operation of air-conditioning equipment for both large and small buildings by persons without previous engineering training or more than "an average knowledge of mathematics." The building and installation regulations taken up in the last chapter are fully explained. The contents are air and its properties; load calculations; duct design and air distribution; registers and grilles; heating and humidification; fans; cooling coils and air washers; fundamentals of refrigeration; compressors, condensers, evaporators, and allied equipment; well water cooling—ice cooling and storage systems; evaporative condensers and cooling towers; small store installations—unit coolers; automatic control of air conditioning; air cleaning and purification; and codes and ordinances.

Air conditioning: Insulation, J. R. Dalzell and J. McKinney (*Chicago: Amer. Tech. Soc., 1937, pp. [8]+301, [pls. 5], figs. 136*).—The properties of various types of insulating materials are dealt with, data compiled from reports of the American Society of Heating and Ventilating Engineers and other standard sources being included together with detailed descriptions of numerous specific commercial brands of insulating materials. The construction of various types of insulated walls and the application of insulation to roofs, in floors, and about heating appliances, pipes, and air ducts is also taken up and illustrated by drawings and photographs. The physics of insulation, kinds of insulation, and where insulation is used are discussed, and transmission coefficients and tables, heating and cooling loads, tables and coefficients, glossary of terms, and design of insulation are given, as well as an index and a psychrometric chart.

A septic tank disposal system, E. R. Gross (*New Jersey Stas. Circ. 381 (1938), pp. 19, figs. 18*).—This circular gives full directions in nontechnical language for the construction of concrete tanks of the one- and two-chamber types (the latter being preferred), together with all necessary connections and absorption areas of two loops of porous tile, to be laid out either in level ground or on the contour of sloping land. The system described includes a diversion gate permitting the alternate use of the two loops of absorption area tiling. Adequately dimensioned plan, section, and elevation drawings and material specifications are provided, and suitable cement mix proportions are given.

AGRICULTURAL ECONOMICS

References on agriculture in the life of the Nation, E. E. Edwards (*U. S. Dept. Agr., Library, Bibliog. Contrib. 34 (1939), pp. V+73*).—Six bibliographies and 137 general references with comments on each are included.

[Agricultural economics and rural sociology] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1938, pp. 1–78, 85–105, 110–114, 153–156*).—In this portion of the Secretary's report, outstanding features of the agricultural situation in this country and its relation to world economy are indicated, and programs and proposals for agricultural adjustment are discussed, including new goals for agricultural research and the status of legislation.

[Investigations in agricultural economics by the Arkansas Station 1937–38 (*Arkansas Sta. Bul. 368 (1938), pp. 100–104*).—General results of investigations not previously noted are reported as follows: Findings (1) by C. O. Brannen as to general property tax delinquency in 1937 as compared with 1936, changes in expenditures of the State government for major functions from 1924 to 1936, and receipts, expenses, and taxes in 1937 on 305 farms studied in cooperation with the U. S. D. A. Bureau of Agricultural Economics as compared with farms studied in the years 1931 to 1936, inclusive; (2) by J. L. Charlton as to school revenues and services in Washington County during the period 1928–37; (3) by W. T. Wilson as to the average size, investment, use of land, types of farming, receipts, and expenses on 407 upland farms studied in cooperation with the Bureau of Agricultural Economics; (4) by O. J. Hall in a study of land use, farm values, and labor requirements in different type-of-farming areas; and (5) by J. G. McNeely as to shifts from 1930 to 1938 in the labor organization on 119 cotton plantations studied in cooperation with the A. A. A. and Bureau of Agricultural Economics.

[Investigations in agricultural economics by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1937–38, pp. 38–42*).—Brief descriptions are included of the major lines of work carried on. Some brief general findings not previously noted are included regarding relation of assessed and sales value of farm real estate, tax rates on farm properties and oil-producing properties, and trends of real estate taxes 1910–35, by H. Howe and L. F. Miller; relation of rainfall to wheat yields in western Kansas, by G. Montgomery; the adequacy of the Kansas City, Mo., wholesale fruit and vegetable market (coop. Mo. Expt. Sta. and U. S. D. A.), Kansas prices of potatoes and price and production in early and intermediate potato-producing States, and daily and seasonal changes in the prices of butter and butterfat and the effects of profits from storage and butter production during the into-storage period and the business situation on the amount of butter stored, by F. L. Parsons; the effects of the poultry enterprise in stabilizing the farm business, of variations in relative prices of poultry and eggs on returns with different types of poultry, and of size of flock on efficiency and income of poultry farms in 1936 as compared with other types of farms, by J. A. Hodges.

[Investigations in agricultural economics by the Maryland Station 1937–38] (*Maryland Sta. Rpt. 1938, pp. 9–20, figs. 2*).—In addition to results of studies previously noted, brief general findings are included as to the number of cows, investments, receipts, expenses, farm and labor incomes, etc., on dairy farms in the upper Eastern Shore area for 1937–38; the investment, income, profits, percentages of eggs incubated from official pullorum-tested and nonofficial pullorum-tested flocks, and of blood-tested and nontested chicks sold, etc., in hatcheries studied for the year ended June 30, 1937; the source and quality of chickens purchased by Maryland poultrymen during the same year; the average acreages, yields, costs of growing potatoes, cash income, etc., for 1936 on Garrett County farms studied; number, volume of business, membership, etc., of cooperative marketing and purchasing organizations; results in Kent County under the 1936 regional agricultural adjustment program and the 1937 experimental agricultural adjustment program; and land utilization, erosion, etc., in the tobacco region in southern Maryland.

[Economic investigations in Michigan] (*Michigan Sta. [Bien.] Rpt. 1937–38, pp. 25, 26*).—Data are reported on factors influencing dairy costs and returns, sugar beet production and marketing costs, and costs and returns from fruit farms in 1937.

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 196 (1939), pp. 7, 8*).—Tables by J. I. Falconer are included (1) bringing the index numbers of production, prices, and income (E. S. R., 80, p. 691) down through October 1938, and (2) showing the October 1938 selling prices of 16 Ohio farm products and the October parity prices of such products. The October 1938 prices of the different products varied from 33 to 110 percent of the parity prices, averaging 79 percent, as compared with approximately 100 percent for the first 9 mo. of 1937.

[Investigations in agricultural economics by the West Virginia Station 1936–38] (*West Virginia Sta. Bul. 290 (1938), pp. 40–48*).—Included are brief general findings in studies of tax delinquency 1928–33, farm mortgages, tax assessments, soil conservation, returns from orchards, cooperative buying of supplies, food and fuel supplied the farm family by the farm, costs of producing and distributing milk, and labor required for the production of crops.

Foreign Agriculture, [January 1939] (*U. S. Dept. Agr., Foreign Agr. Serv., Foreign Agr., 3 (1939), No. 1, pp. 42, figs. 4*).—Articles are included on European Wheat Requirements and Policies, by L. A. Wheeler (pp. 3–14); The Argentine Pear Industry, by P. O. Nyhus pp. 15–26); Soil Conservation in New South Wales, Australia, by L. J. Schaben (pp. 27–32); and Argentine Grain Elevator Program, based on a report by C. L. Luedtke (pp. 33–38). Also included are notes on recent developments in foreign agricultural policy as follows: Artificial fibers from coal contemplated in Germany, Turkey establishes office of products of the soil, Venezuela contemplates greater encouragement to agriculture, northern Ireland assists flax growers, and Dominican Republic regulates rice production and trade.

Inequalities in the Arkansas property tax assessment system, E. E. Sparlin (*Arkansas Sta. Bul. 369 (1939), pp. 27, figs. 4*).—This study was made to determine the extent of the inequalities in the tax assessment system, and the causes and consequences of such inequalities. Analysis is made of the ratios of assessed to estimated value for 1,356 rural and 677 urban properties, of the changes in assessments on 746 rural properties in 19 selected counties, 1914–35 and 1920–31, of the differences of assessment ratios between counties and districts, and of the assessments on automobiles, horses, mules, and cattle in different counties. Recommendations are made for improvements in the assessment system.

The ratio of assessed to estimated value in 1937 averaged 57 percent for the rural properties. The percentages decreased from 113.4 for the group having an estimated value of less than $600, to 39.2 for the group with values of

$40,000 or more. Properties valued at less than $5 per acre were assessed at 140.8 percent of the estimated value, and those valued at $70 or over per acre at 33.4 percent. Farms with 20 percent or less of the land in crops were assessed at 87.7 percent of the value, and those with over 80 percent cropland at 43.3 percent. Low productivity and high assessment percentages and high productivity and low assessment percentages were definitely associated. The ratio of assessed to estimated value for the urban properties averaged 40.5 percent in 1937. Properties worth up to $599 and between $600 and $1,199 were assessed at 78 and 86 percent, respectively. The ratios then decreased to 28.5 percent for properties valued at $40,000 or over.

The 746 properties in the 19 counties studied changed in assessed valuation only 2,535 times out of a possible 8,206 from 1914 to 1935. Forty-five of the properties were assessed at the same amount throughout the period. The average ratio of assessed to estimated value varied from 27.2 to 77.8 percent in the districts of the State that were studied. The average assessed valuation of automobiles varied from $49.17 to $132.13 between counties, and that of horses and mules from $13.03 to $55.37. In 1 county only 43.1 percent of the automobiles were on the tax book in 1937.

"Uniform value schedules should be established for use in assessing property in Arkansas. Farms should be assessed according to productivity rating for the soil and value ratings for improvements. Cities should be zoned into value areas in order to establish land values, and the buildings should be assessed according to uniform standards. Personal property could also be subjected to considerable standardization for valuation purposes."

A State agency for administering the property tax and the appointment of county assessors on merit and for a term of at least 4 yr. are also recommended.

State-owned land in Arkansas, O. J. Hall (*Arkansas Sta. Bul. 370 (1939), pp. 34*).—This report analyzes the origin of State-owned lands and the subsequent disposition of land to which the State received title for the period 1928–37. The data used were collected from the records of the State Land Commissioner. The present methods of certification of land to the State, of redemptions, and of donations and sale by the State are described and their operations discussed. Some data from other studies of the agricultural possibilities of State-owned land are also included and discussed. Suggestions for improvements in the procedure relating to foreclosure on tax-forfeited land and policy relating to use and disposition of State-owned lands are made.

The amount of State-owned land increased from 1,003,023 acres on January 1, 1929, to 1,448,453 acres on January 1, 1934. Certifications of land delinquent for 1926 to 1930 assessments amounted to 1,695,066 acres by January 1, 1934. In 1933 there were 1,557,334 acres due to be certified, of which only 21.1 percent was certified. Redemptions from the State 1928–37, inclusive, amounted to 1,368,542 acres, of which over 48 percent was under special acts passed and in force during the period 1933–35. Applications for donations of State-owned land 1928–37 amounted to 814,096 acres. Only 32 to 40 percent of such applications during the years 1927–29 resulted in deeds by January 1, 1934. For the period 1928–37 sales of State-owned lands amounted to 1,001,028 acres, of which 61 percent was sold during 1936–37.

The study of 621 State-owned tracts in 168 townships in 1938 showed 53.6 percent were not suitable for homestead or farming purposes, 28.4 percent had been redeemed or sold by the State or the State's title was questioned, and only 18 percent had possibilities for homestead use.

"Analysis of certifications of land to the State and movement of State-owned land to private ownership shows (1) the need for changes in procedure on foreclosure of tax-forfeited land to give the State a clear title, and (2) the desirability of a policy for disposing of State-owned land according to the uses for which it is best suited."

County land management in northwestern South Dakota, R. J. Penn and C. W. Loomer (*South Dakota Sta. Bul. 326* (*1938*), *pp. 51*).—This bulletin is based on information obtained from county officials, the South Dakota State Planning Board, and the U. S. D. A. Bureau of Agricultural Economics, and by questionnaires. The landownership in the area, and the methods and results of the current practices in acquiring leases and selling county lands are described and discussed, the major emphasis being placed on the lease procedure. The State legislation on the several subjects is summarized. Suggestions for administrative and legislative reforms are made.

In the eight counties studied, 43 percent of the land is nontaxable, the amount ranging from 18 to 94 percent. In 1938 nearly 2,000,000 acres (17 percent) were subject to tax deed action, and 903,000 acres were under contract for the payment of back taxes. Less than one-fourth of the total land area was taxable land on which the taxes were fully paid. In June 1938 the total county lands in the eight counties were approximately 1,260,000 acres, of which over 1,000,000 were held by four counties. Approximately 883,000 acres of this land were leased to farm and ranch operators. Grazing land predominated, and the usual lease price was 5 ct. per acre. The sales of county land to date are estimated at about one-tenth of the present holdings.

Among the suggestions for possible changes in administration are that the management of various types of public land be consolidated under one agency, that the administration of tax-reverted lands be removed from the counties to other agencies, possibly the State, and that the local governments be permitted to use the land in other ways than by sale or lease. Where landholdings by counties are large property departments might be established capable of adequately supervising such lands, the counties reserving the right to control the use of leased county lands. Lease rates might be made proportional to the productive value of the lands, long-term renewable leases might be offered, State laws should provide an effective means of dealing with trespassing on county lands, the tax deed procedure should be shorter and less expensive, and the tax title should be given more legal strength.

Farm mortgage foreclosures in southern Iowa, 1915–1936, W. G. Murray (*Iowa Sta. Res. Bul. 248* (*1938*), *pp. 245–276, figs 9*).—Information obtained from courthouse records of all (12,361) farm mortgages foreclosed 1915–36 in 31 counties constituting the 3 southern tiers of counties of the State was analyzed to show the variation of number and amounts of mortgages foreclosed in different periods of the 22 yr., the classification of foreclosures according to lenders or mortgage holders, and the reasons for variations in foreclosures among the counties.

The area foreclosed on in the 22 yr. was equal to 19.8 percent of the farm lands in the counties, ranging in the different counties from 11.8 to 38.1 percent. The total judgments amounted to $127,768,000, or an average of $68 per acre. From 1915–20 the number of foreclosures per year varied from only 43 to 95. The period 1921–30 was "the junior mortgage foreclosure period," with 258 to 746 foreclosures per year, and approximately 1 percent of the land foreclosed on annually. The "first mortgage depression period", 1931–33, had 1,033 to 1,808 foreclosures per year, with a peak of 3 percent of land foreclosed in 1932. During the "moratorium period", 1934–36, the number of foreclosures dropped to 687, 650, and 582 per year. Of the foreclosures, 42 percent were made by individuals, 27 percent by insurance companies, 15 percent by banks, and 16 percent by the Federal Land Bank, joint stock land banks, loan companies, and miscellaneous lenders. Individuals and banks, the group with second mortgages and heavy first mortgages, made the majority of the foreclosures prior to 1930. Insurance companies, joint stock land banks, and the Federal Land Bank—first mortgage lenders— made most of the foreclosures in 1930 and thereafter. Percentage of land mortgaged, deeding in lieu of foreclosure, differences in profitableness of farming, and crop yields did not explain the variations in the percentages of land foreclosed in this district. Foreclosures tended to be more frequent on eroded land. A definite relationship was apparent between good soil and few foreclosures, and between poor soil and many foreclosures. A clearly defined relationship was found between high land values and few foreclosures and low values and many foreclosures, indicating a general tendency to overappraise the less valuable land.

An economic study of land utilization in Wyoming County, New York, H. R. Kling (*[New York] Cornell Sta. Bul. 707 (1938), pp. 56, figs. 34, map 1*).—This bulletin continues the series (E. S. R., 79, p. 693) previously noted. The climate, topography, and markets of the area, the changes in types of farming since about 1850, and the classification of land are described. The use of land in each land class, the types of soils in each land class, and use of lands on each type, the use of land at different elevations, the number of livestock per farm, and size and condition of buildings on each land class, the value of land and buildings, tax delinquency, etc., are analyzed. Membership in the farm bureau and participation in the 1937 Agricultural Conservation Program, and the length of tenure are discussed, and a desirable program for developing roads, rural electrification, and reforestation in the area is outlined.

The soybean industry, compiled by H. E. Hennefrund and E. M. Colvin (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 74 (1938), pp. VII+474*).—Included are 1,407 references to material published in the United States from 1900 to June 30, 1938, grouped under the headings of general, cost of production and returns, grading and standardization, harvesting, marketing, oil, protein and moisture content, statistics, storage, and utilization (general, industrial uses, farm uses, and food uses). "References on the botany, chemistry, and culture of soybeans and on varieties have been omitted except, where they have appeared incidentally with other material. Recipes, where food value is not a part of the content; articles on processing methods and refining of soybean oil and the factors affecting them have also been omitted. Works in foreign languages and works published abroad have not been included except where the material relates to the industry in the United States." A list of 206 patents relating to soybean products and processes is also included.

The economic condition of the potato industry in New Jersey, A. G. Waller and J. W. Carncross (*New Jersey Stas. Bul. 652 (1938), pp. 22, figs. 21*).—Acreage, production, prices, yield developments, costs of production, etc, in New Jersey, other States, and the United States; the costs and yields in New Jersey necessary to meet varying prices; the effects of developments of motorized machinery on the industry in New Jersey; the prices and distribution of the New Jersey crop in different markets; and freight rates are discussed. The prices of potatoes and other farm products in New Jersey are compared.

The total acreage of potatoes in New Jersey decreased from nearly 100,000 acres in 1917 to 38,000 in 1930, then gradually increased to 56,000 in 1937. These 56,000 acres produced nearly as many bushels as the average production from 80,000 acres in the period 1920–24. The price trend for potatoes in New Jersey has been downward since 1925. The average yield in New Jersey was 132 bu. for the period 1920–24, and 163 bu. for the period 1930–34. Studies of the man labor requirements showed the average up to harvest was 37 hr. in 1926 and 21 hr. in 1936. The average acreage of potatoes per farm increased from 60 in 1931 to 80 in 1936. During the period 1933–37 potato prices averaged 3 percent, and those of all farm products 18 percent above the prewar prices. Prices for vegetables for market averaged 8 percent below the prewar prices.

An economic survey of farm orchards in counties near Baltimore, Md., and Washington, D. C., S. B. CHASE and A. L. SCHRADER (*Maryland Sta. Bul. 421 (1938), pp. 53–84, figs. 15*).—Records were obtained in 1935 by the survey method of 72 farms in 6 counties. Analysis is made for apples and peaches as to the size of orchards, varieties, age of trees, yield and terminal growth of trees, etc. The orchard practices on the farms are discussed and compared. Tables are also included and discussed showing for 1933–34 the production and sale of fruits, the ways that fruits were utilized on the farms, and the methods used in making sales.

The citrus industry of Palestine, N. W. HAZEN (*U. S. Dept. Agr., Bur. Agr. Econ., F. S. 78 (1938), pp. 96, figs. 37*).—The citrus industry of Palestine is described and various factors that may affect its future development are discussed. The report is based in part on field investigations made by the author in January 1938. It covers the general aspects of the industry, such as climate, soils, water supply, acreages, production, marketing, and citrus exports; the production and marketing of oranges, including sections on varieties, management and cultural practices, yields, diseases and pests, production costs, seasonal exports, distribution of exports, etc.; the production and exports of grapefruit and lemons; and the outlook for production and exports on citrus fruit.

Cost of producing extracted honey in California, R. L. ADAMS and F. E. TODD. (Coop. Calif. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 656 (1939), pp. 35, fig. 1*).—This is the fourth in a series of studies (E. S. R., 71, p. 268). Data were collected by the survey method covering the operation of 224 beekeepers in 1933. The seven major honey-producing areas of the State are described, and various economic factors are analyzed. Measures for improvement in management are discussed.

The average investment per colony was $11.34. The gross cost per colony averaged $4.67, of which $1.10 was overhead—depreciation and interest—and $3,57 operating costs, of which labor was $1.90, transportation 87 ct., and supplies 47 ct. The average credit for byproducts was 74 ct. per colony. Cash costs amounted to $2.06 per colony. The average honey production was 57 lb. per colony, and the average cost per pound 6.9 ct., of which 2.3 ct. was cash costs. Yield, labor, transportation, and investment were the chief factors affecting cost per pound. The average net cost per pound of honey was 3.1 ct. in 12 low cost apiaries and 16 ct. in 12 apiaries having costs of 14 to 18 ct. At 1933 prices 87 lb. of honey was required to pay average expenses of production. Only 10.3 percent of the enterprises studied showed a profit, and 80.6 percent were operated at a loss.

The fruit and vegetable supply of Louisville, C. D. PHILLIPS (*Kentucky Sta. Bul. 387 (1938), pp. 313–352, figs. 5*).—Tables and charts are included and discussed, mainly for the years 1934–37.

The consumption of fruits and vegetables in the metropolitan area of Louisville May 1, 1937–April 30, 1938, was approximately 11,000 carloads, of which approximately 3,700 were locally grown, 4,627 shipped in by rail, and 2,500 by truck. Itinerant truck merchants purchased an equivalent of 210 carloads of fruits and vegetables on the market, and in addition it is estimated that the equivalent of 320 carloads of potatoes, strawberries, greens, and sweetpotatoes were shipped from the area by cooperative associations or purchased directly from growers by itinerant truck merchants. The bulk of the shipments from the area went to markets to the north and east of Louisville.

Roadside marketing of horticultural products in Kansas, F. L. Parsons (*Kansas Sta. Circ. 194 (1938), pp. 27, figs. 19*).—Information was secured during the summers of 1935 and 1937 regarding 124 roadside markets in different parts of the State. The extent of roadside marketing in the State, the location, buildings, equipment, etc., of the markets, and the products handled, handling costs, prices charged, distribution of business during the day and among days of the week, personnel, patronage, advertising, etc., are described. The common mistakes in roadside marketing are pointed out and suggestions and recommendations made based on a detailed study of 32 of the more important markets in the central and eastern part of the State. The farmers' fruit and vegetable markets in Kansas City, Wichita, and Manhattan, and cooperative farm women's markets are briefly described.

The service of Federal grain standards (*U. S. Dept. Agr., Misc. Pub. 328 (1938), pp. [2]+18, figs. 9*).—This is a popular discussion of the conditions existing prior to the passage of the U. S. Grain Standards Act in 1916, the purposes and main provisions of the act, the methods of making inspections, certifications, etc., and the benefits of the system.

Does it pay to grade eggs? P. R. Poffenberger, S. H. DeVault, and S. B. Shaw (*Maryland Sta. Bul. 418 (1938), pp. 279–308, figs. 15*).—Data for the year ended October 31, 1937, were obtained by questionnaires and personal interviews from 30 egg producers in Harford and Baltimore Counties. Of these 15 sold to a distributor on a U. S. Government graded basis, and 15 sold on a nongraded basis to hucksters, retailers, wholesalers, and directly to consumers. The average net prices on graded and ungraded basis were 26 and 25.9 ct. per dozen. The weekly price of graded eggs was higher than that for nongraded eggs for 25 weeks, lower for 23 weeks, and the same for 4 weeks. The production of both groups followed the same seasonal trend, but there was a greater fluctuation for the nongraded group. Prices for graded eggs were affected less by volume shipped. The differential in weekly prices for the various U. S. grades increased inversely with the volume shipped to market. The price of all grades followed a seasonal trend, varying inversely with the total volume sold. Size as well as quality influenced the price received by producers. "It is profitable for a producer of high quality eggs to sell them on a graded basis, whereas it is questionable if producers of low quality eggs can sell them profitably on such a basis."

Crops and Markets, [December 1938] (*U. S. Dept. Agr., Crops and Markets, 15 (1938), No. 12, pp. 257–312, figs. 4*).—In addition to the crop and market reports of the usual types, tables are included showing (1) by States for 1937 and 1938 and average 1927–36 the acreages harvested, yields per acre, production, and other data for important crops; (2) by States the utilization of corn for grain, silage, hogging down, grazing and forage, 1937 and 1938; (3) average prices received by farmers for different farm products on the 15th of each month, July 1928 to November 1938; (4) by groups of States the estimated gross costs and net cost per acre and net cost per bushel of production of corn for grain, wheat, and oats; and (5) similar data for cotton by States per acre and pound of lint.

RURAL SOCIOLOGY

[Sociological studies in Arkansas] (*Arkansas Sta. Bul. 368 (1938), pp. 69, 70, 105–107*).—Topics discussed were sickness and medical care among the Negro population in a delta area, by I. C. Wilson; and the general growth of population, rural and urban characteristics, fluctuating trade centers, and migration and social and economic opportunity, all by W. H. Metzler.

The development of planned rural communities, C. P. Loomis. (U. S. D. A.). (*Rural Sociol., 3 (1938), No. 4, pp. 385–409, figs. 5*).—Families on the seven rural resettlement projects noted on page 842 were compared as to their social activities with the communities of residence previous to resettlement. The activities of families in the Indian-Mexican village, the Dutch truck farming community, and the area on an irrigation project noted on page 842 were also studied for comparative purposes. Preliminary analysis indicates that the families on the resettlement projects are developing a community life which is in many respects unique. Blood relationship ties among associating families were not so common, but associating families lived closer together geographically, were more dependent upon one another for various types of assistance, and in more instances had children who played together than was the case in the other communities.

A basis for social planning in Coffee County, Alabama, K. Shafer (*U. S. Dept. Agr., Farm Security Admin. and Bur. Agr. Econ., Social Res. Rpt., 6 (1937), pp. [4]+50, figs. 6*).—In general, the distribution and growth of the population in Coffee County has varied with the quality of the land. In the southern part of the county where the better land is located, population is more dense and growth is more pronounced. It seems probable that the best land areas will continue to sustain the number now living on them and perhaps will absorb some additional population. In the intermediate land areas population probably will not increase and may decrease. In the poorest land areas the population will probably continue to decrease because of the great necessity of increasing the size of farms in that area. For over a decade the number of people in these areas has been declining. The school is the major public institution of the county. In the poorest land areas the schools are smaller, averaging only 1.4 teachers per school. In the best land areas the average is 4.4 teachers per school. Enrollments per school and the attendance are also higher in the best land areas. The declining population and the competition of the more strategically placed economic centers have broken down the small localities, and the larger urban centers are meeting only certain economic needs of the county.

Standards of living in four Southern Appalachian Mountain counties, C. P. Loomis and L. S. Dodson (*U. S. Dept. Agr., Farm Security Admin. and Bur. Agr. Econ., Social Res. Rpt., 10 (1938), pp. [4]+59, figs. 3*).—Continuing previous work (E. S. R., 78, p. 559), this study, made in 1935, has to do with the level of living of 733 open-country farm families and 83 village nonfarm families in two Kentucky counties in the Northeastern Cumberland Plateau and in two North Carolina counties in the Blue Ridge subregion of the Appalachians. The average values of living, including the values of all goods and services consumed, were $662, $426, and $798 per family for open-country owners, open-country tenants, and village families; per capita they were $143, $87, and $210. Less than one-half of the value of living for the farm families was purchased; 83 percent of that for the village families was purchased. Open-country owner and tenant families allocated 53 and 62 percent of their total values of living to food; village families reported 35 percent for this category. Per family, the average values of food for these three groups were $351, $263, and $281; per capita they were $76, $54, and $74; and per adult male equivalent unit they were $85, $68, and $88. The average expenditures for clothing per family were $78, $52, and $114 for owners and tenants in the open country and for village families, respectively. One-half of the male heads of families who operated farms had supplementary occupations. One-third reported that their supplementary occupations comprised unskilled labor. Open-country owner and tenant and village male heads had completed 6.4, 5.2, and 6.8 grades, respectively. The amount of education is positively correlated with total value of family living.

Standards of living of the residents of seven rural resettlement communities, C. P. Loomis and D. M. Davidson, Jr. (*U. S. Dept. Agr., Farm Security Admin. and Bur. Agr. Econ., Social Res. Rpt., 11 (1938), pp. [4]+93, figs. 5*).—Three separate groups of families were studied for yearly periods, mostly the year 1935—(1) families which had lived on the projects for at least 1 yr. previous to February 1, 1936; (2) families that had been on the projects less than 1 yr. prior to the time of the interview, their social and economic activities being studied for the year prior to settlement; and (3) 70 families living in the neighborhood of two of the projects. Among the project groups there was a great variation in the total value of living, ranging from $532 to $1,078, respectively, for Cumberland farms, Ala., and Bosque, N. Mex. A larger proportion of the total value of living was allocated to food than to any other single item. The average value of housing and maintenance ranged from $52 at the Ashwood, S. C., project where all of the families were living in temporary structures to $287 for the Ropesville, Tex., farms project where the families were living in new houses.

The families studied were relatively young as they were selected for settlement by criteria which excluded older families as well as one-member and broken families. The average number of school grades completed by the male heads ranged from 4.3 for those at Cumberland farms to 9.7 for those at Ropesville.

Standards of living in the Great Lakes cut-over area, C. P. Loomis, J. J. Lister, and D. M. Davidson, Jr. (*U. S. Dept. Agr., Farm Security Admin. and Bur. Agr. Econ., Social Res. Rpt., 13 (1938), pp. [4]+63, figs. 3*).—This study depicts the 1935 levels of living of 850 open-country and 122 village families residing in the Great Lakes cut-over area. The average values of all family living goods and services used by the 850 open-country families was $1,031, of which 59.5 percent was purchased, and for the village families $851, of which 88.5 percent was purchased. The comparative average value of housing and maintenance was $266 and $236; and of food $446 and $306. In the case of the open-country families, 60 percent of the food was produced on the farm, while with the village families 88 percent was purchased. The open-country family spent an average of $97 for maintenance of an automobile, while the village family spent $66. There was a positive correlation between the size of the farm enterprise and the total value of family living. The average investment (other than the home farm) of the open country and village was $57 and $75 respectively. During 1935, 44 percent of the farm operators reported supplementary occupations, principally in jobs which required unskilled labor. The average size of the open-country family was 3.9 persons, while the village family was 3.2 persons. Formal educational attainments of the male heads and homemakers in the village (6.8 and 8.2 grades) were slightly higher than in the open country (6.1 and 6.4 grades).

Standards of living in an Indian-Mexican village and on a reclamation project, C. P. Loomis and O. E. Leonard (*U. S. Dept. Agr., Farm Security Admin. and Bur. Agr. Econ., Social Res. Rpt., 14 (1938), pp. [4]+49, figs. 2*).—Thirty-seven Indian-Mexican families in Tortugas, N. Mex., were interviewed. Total cash receipts for these families of farm laborers averaged $344, which was composed of $268 from wages, approximately one-half of which was earned from public works, and of $76 accruing from gifts, cash relief, and the production and sale of a few farm products by three of the families. The average total value of family living for the 37 families was $347. Food, housing and maintenance, and clothing absorbed $298, or 85 percent of the total value of family living. The average family was composed of 5.3 members. It was housed in a 2-room dwelling that had a replacement value of $166. The average schooling for the male heads was less than 2 yr. of attendance, for the homemakers less than 3 yr. The 57 children over 6 yr. of age and not attending school had completed only slightly over 3 grades.

Sixty-five families on the Tule Lake reclamation project (see p. 844) were interviewed. The average value of their family living was $2,843. Food was the largest item of consumption, $856, and housing and maintenance next, $702. Automobiles after all pick-up and other trucks were eliminated absorbed an average of $455 of the total cash expenditure. The average family was composed of 3.9 persons, living in a house that averaged 4.5 rooms in size and had a replacement value of $1,794. The parents had completed an average of 10 grades each, while the children over 6 yr. of age and not then going to school had completed an average of 11 grades. Only one family received public relief. Most cash expenditures for recreation and social participation were made in nearby towns. "The community studied has few of the rural attributes common to other rural communities. It is rural only to the extent that the inhabitants live in the open country."

Social relationships and institutions in an established rurban community, South Holland, Illinois, L. S. Dodson (*U. S. Dept. Agr., Farm Security Admin. and Bur. Agr. Econ., Social Res. Rpt., 16 (1939), pp. [6]+56, figs. 2*).—This study is primarily concerned with the contrast between the South Holland community and the towns and cities surrounding it. This community is different because of its unusual powers of self-determination and self-direction, attributed to an intricate pattern of blood relationships whereby four families and their kin probably constitute more than one-half of the population of 1,873 persons, the dominating position of the church, an unusual degree of social control exercised jointly by the family and the church, and the still potent cultural heritage of the Dutch people. However, although South Holland has repulsed the real estate subdivider and all commercialized amusement and has retained Sunday observance, agriculture is declining, the language of Holland is on the wane, Calvinism is giving ground, the public school is rather generally preferred to the Christian school, the youth, especially those who go to college, are breaking away from tradition and custom, and a changed attitude toward amusements is arising.

The chief occupations are farming and industrial work. Only 40 percent of the heads of families gave farming as their occupation, but many young men are in the shops only in the winter and work on the farms the remainder of the year. It is estimated that probably three more generations will have expired before South Holland loses so much of its identity that it is submerged beneath the blanket of urbanism and industry that now covers the territory.

Social status and farm tenure: Attitudes and social conditions of Corn Belt and Cotton Belt farmers, E. A. Schuler (*U. S. Dept. Agr., Farm Security Admin. and Bur. Agr. Econ., Social Res. Rpt., 4 (1938), pp. [6]+253+[12], figs. 36*).—This preliminary report is a study in social psychology along novel lines, dealing with the attitudes, opinions, and aspirations of families in the two regions whose economic and social status is to a considerable extent predicated upon their land-tenure status. Successive chapters deal with region and race, attitudes and opinions, the agricultural ladder and its operation, landlord-tenant relationships, moves and migration, group life in the country, and levels and standards of living.

Differential mobility within the rural population in 18 Iowa townships, 1928 to 1935, R. E. Wakeley (*Iowa Sta. Res. Bul. 249* (*1938*), *pp. 277–318, figs. 15*).—Shifts of population from rural areas to other rural or urban areas consisted mostly of young people between the ages of 16 and 25 yr. They migrated relatively short distances when they left home, nearly all being located in Iowa or adjoining States. Males tend to locate farther from home than females. Females migrate younger than males and in larger proportion.

Migration of young people was delayed somewhat but did not stop during the depression. Those who left home before 1929 either did not return home or having returned they had again left home previous to January 1, 1935. Stability of residence rather than mobility was characteristic of rural households during this 7-yr. period. Strong tendencies were apparent for rural families to remain in the same locality and to live exclusively either in the country or in the village. Farmers are more likely to move to another township than are villagers to move out of the village in which they reside. Such change of residence is apt to be associated with a change in occupational status. Farm tenants and farm laborers do most of the moving; a higher proportion of them move and they move more frequently than owners.

Few farmers now on farms in Iowa have received relief. The proportion is higher among tenants, and data stress the insecurity of the farm laborer and of former farm operators living in the village. The size of the farm and the age of the farm operator appear to affect mobility only as they are associated with tenure status.

Family selection on a Federal reclamation project—Tule Lake division of the Klamath irrigation project, Oregon-California, M. Jasny (*U. S. Dept. Agr., Farm Security Admin. and Bur. Agr. Econ., Social Res. Rpt., 5* (*1938*), *pp.* [*4*]+*88, figs. 8*).—In this second report on family selection (E. S. R., 78, p. 273), the appraisals of the selection board of the Bureau of Reclamation in 1927 and the quality later demonstrated by the settlers were found in this field study to be fairly well correlated. Low appraisals, particularly, showed a high degree of reliability. Therefore, had applications outnumbered homestead opportunities the selection process would have excluded many more undesirable than desirable applicants. If all those rated 95 or lower had been rejected, 88 percent of the homesteaders who later proved to be undesirable as either farmers or citizens, or both, would have been excluded.

Another conclusion derived is that the quality of applicants as farmers and citizens is far from being the only determinant of their stability as homesteaders. Whether people will strike root or leave is to a considerable extent outside the control of selection. Some elasticity as to the size of farms seems highly desirable in any type of land settlement. On the Tule Lake division, it was found that this elasticity was provided by settlers who desired to leave or lease. Farming experience measured in years weighted by ability to utilize experience is a highly important but not indispensable qualification. The presence of a physician on the selection staff would be highly desirable.

Influence of drought and depression on a rural community: A case study in Haskell County, Kansas, A. D. Edwards (*U. S. Dept. Agr., Farm Security Admin. and Bur. Agr. Econ., Social Res. Rpt., 7* (*1939*), *pp.* [*6*]+*116, figs. 14*).—In Haskell County the type of farming, the size of population, and the whole set-up of community organization have tended toward what could be supported under the most favorable conditions that existed during the first and subsequent periods of greatest immigration. Cyclic periods of wet weather brought new streams of immigrants, and there was a strong tendency to overdevelop the area. Under such circumstances the occurrence of a severe drought constituted a disaster of major significance to the community.

A period of disorganization follows the onset of each drought. The continuance of the drought over a period of years leads to a decrease in size of population, fewer trade agencies, and a diminished emphasis on commercial forms of recreation. Assistance from local and Federal sources, in various ways, has played an important part in the alleviation of the consequences of drought. The end of each extended dry period is followed by a readjustment to more favorable weather conditions. The author thinks there is a good chance for the success of a program of adjustment on a sound basis. One obstacle to the effectiveness of a long-range program of adjustment lies in the fact that about two-thirds of the land is owned by nonresidents of the county, for many of them do not understand farming and are entirely unfamiliar with conditions in western Kansas.

"In a planned economy there would be, presumably, opportunities for farmers not needed in the area to engage in farming in other places or to secure employment in industry. As such conditions do not prevail at the present time, continued subsidy and the tendency to instability of production must be weighed against the cost of regrassing the land and of resettling the people elsewhere, as well as some estimate of the unwillingness of these people to move to other areas."

Analysis of 70,000 rural rehabilitation families, E. L. KIRKPATRICK (*U. S. Dept. Agr., Farm Security Admin. and Bur. Agr. Econ., Social Res. Rpt., 9 (1938), pp. [4]+93*).—In these studies, involving 30,000 cases in Alabama, 20,000 in Arkansas (E. S. R., 78, p. 129), and the remainder in 11 other States, practically all of the rehabilitation clients were bona fide farmers. A large proportion of the applicants were tenants, noticeably exceeding the percentages represented in the total farm population, but generally the farm laborer was not reached by the program in proportion to his representation in agriculture. The clients were noticeably mobile. For the most part the groups were made up of middle-aged farmers whose families were larger than average for the farm population in their respective States or regions. The studies tend to emphasize the question of whether greater attention can be directed to younger men in the program. In most instances the formal education of the group was at a relatively low level, with wide variation by States and/or types-of-farming areas. Such living facilities in the home as electricity and piped-in water were far less common among these families than was characteristic for all farmers in the respective States or regions. Also, inadequate housing was indicated in comparison with data available for similar areas. For the most part the families represent farm population on economic levels that are below the minimum for decent standards of living.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Rural sociology extension in the agricultural colleges, A. F. WILEDEN. (Univ. Wis.). (*Rural Sociol., 4 (1939), No. 1, pp. 43–57, fig. 1*).—Rural sociology extension in the agricultural colleges had its beginnings even before the passing of the Smith-Lever law. With one interruption, its history from the beginning has been one of steady expansion. Rural sociology extension has been struggling, amidst many specialized programs in the agricultural colleges, to find its field.

An appraisal of 4–H club benefits, W. H. Peterson. (Mont. State Col.). (*Rural Sociol., 3 (1938), No. 3, pp. 303–308*).—The 4–H students in the Montana State College (boys and girls) participated in college activities during 1934–38 about one-third more than did non-4–H students, the 4–H boys participating over 50 percent more than the non-4–H boys. Longer membership in 4–H club seems to mean increased participation in college activities and a slightly higher scholastic standing, as shown by this study. The scholastic standing of the two groups was not significantly different, but was slightly higher for the 4–H students. A larger percentage of the 4–H students who were enrolled at the college during the winter quarter of 1937 reenrolled during the winter quarter of 1938 than did non-4–H students. The effect of 4–H training was more pronounced in the sophomore and junior years of college than in the freshman and senior years.

Money income and expenditures of thirty-seven 4H Club girls in North Dakota during 1937, D. G. Hay and S. Best (*North Dakota Sta. Bimo. Bul., 1 (1938), No. 2, pp. 7–9, figs. 3*).—Charts are included and discussed showing the distribution of total cash expenditures which averaged $52.35. The percentages for different purposes were: Clothing 50.5, medical care 12.6, education 8.8, money shared with others 6, food 5.2, personal care 4.1, recreation 4, home furnishings 3.4, savings 1.8, miscellaneous 3.7. Of the $19.49 total money income, 51.1 percent was from allowances, 31.1 from earnings, and 17.8 from gifts.

FOODS—HUMAN NUTRITION

Food for the family, J. S. Wilmot and M. Q. Batjer (*Chicago: J. B. Lippincott Co. [1938], pp. X+619, figs. 147*).—This college textbook is divided into three sections, (1) health as an important factor in a happy life and the role of food in a health program, (2) food selection and preparation, and (3) the planning and serving of meals. The appendix contains excerpts from the sections of the sanitary code and regulations governing the production and distribution of milk and milk products in New York City, weekly plans for diets for groups on different income levels, and information on stain removal.

[Food studies by the Arkansas Station] (*Arkansas Sta. Bul. 368 (1938), pp. 67, 68*).—Progress reports are given by H. Reynolds on the effect of the presence of small amounts of tin or iron on the ascorbic acid content of canned tomatoes as determined by indophenol titration and on the cause and prevention of spoilage of home canned vegetables.

Meat food products (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1938, pp. 37, 38*).—A summary is given of studies on the comparative nutritive values of refined steam lard, leaf lard, neutral lard, hydrogenated lard, oleo oil, peanut oil, refined cottonseed oil, and hydrogenated cottonseed oil as determined by growth and digestion tests on rats.

Recent developments in meat cookery research, A. M. Child. (Univ. Minn.). (*Jour. Amer. Dietet. Assoc., 14 (1938), No. 8, pp. 623–628*).—Some of the practical applications deduced from meat cookery experiments carried on by the University of Minnesota and by the cooking committee of the Cooperative Meats Investigations are discussed in this review paper.

The use of lard in cake making, H. Baeder (*Nebraska Sta. Bul. 320 (1938), pp. 19, figs. 3*).—Three methods of mixing were developed for making cakes, using the butter cake formula and replacing the butter with 70 percent by weight of lard, increasing the sugar content 10 percent and the liquid 15 percent, and substituting 22.4 percent cornstarch for general-purpose flour.

The hot-lard method, which is a variation of the muffin method of mixing, proved satisfactory for cakes made with soft or melted lards kept without refrigeration. The single-stage method, by which all ingredients are mixed together at one time, was also satisfactory for soft lards. The cornstarch method, which is a modification of the sponge batter method, was judged more desirable for use with firm rather than soft lards. The flavor of rancid lard produced by poor storage conditions was masked by the hot-lard and corn-starch methods of mixing.

Of 1,567 homemakers who filled out a questionnaire, about two-thirds preferred butter and more than half used it in cakes, less than one-fifth preferred cream and about one-fourth used it, and only 3 out of every 100 women preferred lard, although almost one-fifth used it. The reasons listed most frequently for the use of a given shortening were availability and the flavor and texture of the resulting cake. In the absence of butter and cream, lard was preferred to any of the manufactured products such as hydrogenated fats, oleomargarine, and vegetable oils.

A review of investigations on the nutritive value of eggs, M. S. Rose and E. M. Vahlteich (*Jour. Amer. Dietet. Assoc., 14 (1938), No. 8, pp. 593–615, figs. 7*).—The results of studies on the nutritive value of eggs in the diets of experimental rats are discussed, and information is given on the composition of the egg, the digestibility and utilization of the various components, the mineral and vitamin contents, the sensitivity of humans to eggs, and the contributions of the egg to the diet. The bibliography lists 94 references.

A study of the waste in preparation and in cooking of fresh vegetables and the fuel consumed, E. F. Whiteman and F. B. King. (U. S. D. A.). (*Jour. Amer. Dietet. Assoc., 14 (1938), No. 8, pp. 615–622*).—The losses in preparing and cooking 25 kinds of vegetables and the consumption of gas and of electricity during the cooking processes were determined, following the cooking methods of Loughlin (E. S. R., 69, p. 462) and using large enough samples to yield 1 cup of cooked product. Preliminary tests were made to determine the quantity of water necessary, the length of the cooking period, and the control of the fuel.

The waste in preparation (the difference between the edible portion weight and the as purchased weight) plus the loss in cooking (the difference between the edible portion weight and the weight after cooking) was less than 10 percent for broken snap beans, white potatoes (boiled or steamed in the skin), and unpared sweetpotatoes; from 10 to 20 percent for pared sweetpotatoes, turnips, parsnips, onions, carrots, eggplant, broccoli, cabbage, whole snap beans, and tomatoes cooked without water; from 20 to 40 percent for baked potatoes, beets, brussels sprouts, cauliflower, celery, spinach with leaf stalks, cymling squash, and steamed whole parsnips; and from 40 to 75 percent for turnip tops, spinach without leaf stalks, kale, peas, beet tops, asparagus, lima beans, and corn on the cob.

While it required a longer time to heat the same quantity of water to boiling by electricity than by gas, more British thermal units were required by the latter method to maintain the boiling temperature for all vegetables except spinach. The vegetables cooked by electricity required a total cooking period of from 2 to 4 min. longer than when gas was used with the exception of steamed potatoes, which required 7 min. longer, spinach 1 min., and tomatoes no additional time.

Lactic acid-producing bacteria in fermentations and food spoilage, C. S. Pederson. (N. Y. State Expt. Sta.). (*Food Res., 3 (1938), No. 3, pp. 317–321*).—The author reviews the characteristics of the Gram-positive, nonmotile, lactic acid-producing bacteria, and points out some of the similarities in the desirable and undesirable changes in food products that are brought about by these apparently divergent types of fermentation.

[Nutrition research by the Arkansas Station] (*Arkansas Sta. Bul. 368 (1938), pp. 10–13*).—Progress reports (E. S. R., 79, p. 417) are given by B. Sure and R. M. Theis on an extension of studies on hyperthyroidism and vitamins (E. S. R., 78, p. 726) to vitamin B_6, by Sure and J. B. DeWitt on the effect of a deficiency of the B vitamins on the oxidative mechanism, by DeWitt and Sure on the identity of reducing substances in citrus fruits, by Sure and Theis on an extension of the series of studies on enzymic efficiency in avitaminosis (E. S. R., 79, p. 140) to vitamin B_6 and chronic vitamin B_1 deficiency, by L. Opper on the pathological histology of endocrines in A and B_1 avitaminoses, and by M. C. Kik on the biological value and true digestibility of whole rice, polished rice, rice polish, and rice bran.

[Nutrition studies by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1937–38, pp. 119–121*).—Progress reports (E. S. R., 78, p. 131) are included on studies by B. L. Kunerth and W. R. Riddell on the vitamin A and flavin content of colostrum and milk at intervals up to the twenty-sixth day of lactation, by M. M. Kramer and M. T. Harman on the effect of an insufficiency but not complete lack of vitamin C on reproduction, abortions, and the condition of the teeth and bones in guinea pigs, and by Kunerth and M. Pittman on the frequency of occurrence of certain foods found in the diets of 228 college freshmen women during 1 week in 2 successive years.

Basal energy metabolism and creatinine in the urine.—II, Prediction of basal heat production from creatinine, N. B. Talbot, A. H. Stewart, and F. Broughton (*Amer. Jour. Diseases Children, 56 (1938), No. 5, pp. 965–968, figs. 3*).—In continuation of a series of papers (E. S. R., 76, p. 721) and following the methods previously reported (E. S. R., 79, p. 419), the authors determined the total calories produced and the rate of excretion of creatinine in 15 normal boys and 27 normal girls, and compared the results with those of an earlier report on 15 children and on 25 adults reported by other investigators.

A correlation was demonstrated between total calories and the 24-hr. excretion of creatinine, which was approximately as accurate as that between total calories and either height or weight. It is concluded that excretion of creatinine may be used as a standard of reference for the evaluation of basal heat production.

Effect of methionine on casein metabolism, M. C. Kik. (Univ. Ark.). (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 2, pp. 304, 305*).—In continuation of previous studies (E. S. R., 79, p. 419), the author determined by nitrogen balance experiments on rats that the average biological value of casein fed at a 9 percent level was 74.9, with 25 mg cystine 79.8, and with 25 mg methionine 84, indicating that methionine promotes the nitrogen retention of casein more effectively than does cystine. The average true digestibilities were 100, 99.3, and 100, respectively.

The effect of amino-acid supplements and of variations in temperature and duration of heating upon the biological value of heated casein, E. O. Greaves, A. F. Morgan, and M. K. Loveen. (Univ. Calif.). (*Jour. Nutr., 16 (1938), No. 2, pp. 115–128, figs. 2*).—In addition to the data previously noted from a preliminary report (E. S. R., 71, p. 563), the authors present the results of feeding experiments on groups of rats receiving the basal diet containing raw casein and casein heated to 140° C. for 30 min., with and without lysine, tyrosine, and cystine.

The raw casein unsupplemented and with lysine had an average digestibility value of 97 as compared to 93 for the heated casein unsupplemented and 90 when lysine was added. The addition of tyrosine and of cystine reduced the digestibility of the raw casein to 96 and 92, respectively, and of the heated casein to 87. The average biological value was 69 for the raw and 57 for the heated casein. The addition of lysine or tyrosine lowered the biological value of the raw casein to 67 and of the heated casein to 61 and 57, respectively, and the addition of cystine raised it to 77 as compared to 66 for the heated casein plus cystine. Additional evidence is presented that histidine as well as lysine is affected by heat, while tryptophan, tyrosine, and cystine are unaffected.

Further growth tests with young rats fed casein supplements heated to 100°, 120°, and 130° for periods of 30 min., 2, 8, and 24 hr. showed that the loss in nutritive value was progressively greater as the length of heating time and the temperature were increased. No greater loss resulted in casein heated for 8 hr. at 100° or for 2 hr. at 120° than when the casein was washed in cold distilled water.

The effect of autoclaving on the nutritive value of edestin, H. A. Waisman and C. A. Elvehjem. (Wis. Expt. Sta.). (*Jour. Nutr., 16 (1938), No. 2, pp. 103–114, figs. 2*).—From a series of feeding experiments with rats receiving diets containing 18 and 24 percent autoclaved and unautoclaved recrystallized edestin or casein as the protein source, the authors demonstrated that the autoclaving reduced the nutritive value of the edestin and that the limiting factor in the diets was lysine.

The availability of calcium in vegetable food materials, L. C. Kung, H. L. Yeh, and W. H. Adolph (*Chin. Jour. Physiol., 13 (1938), No. 3, pp. 307–315*).—By feeding tests with rats maintained on a basal diet similar to the cereal diet of North China, the amounts of available calcium in a number of commonly used vegetables was determined. The calcium of celery cabbage was retained in the body of the rats to the extent of from 95 to 99 percent, Chinese cabbage (*Brassica* sp.) 96 to 100, coriander 92 to 96, rutabaga leaves 82 to 100, turnips 86 to 89, leeks 82 to 84, soybean sprouts 53 to 62, and spinach 15 to 21 percent. Sautéing or steaming the spinach did not appreciably lower the calcium retention value.

Nitrogen, calcium, and phosphorus balances of rural adolescent boys on low cost diets, L. C. Kung and H. L. Yeh (*Chin. Jour. Physiol., 13 (1938), No. 3, pp. 285–305*).—Metabolism experiments were conducted on 14 healthy adolescent boys maintained on test diets containing various cereal fractions as the source of protein and typical of the low cost diets of North China.

The diet containing bread made with wheat flour had an apparent digestibility coefficient of 89 percent, which was lowered to 62 when the bread was made with a mixed flour consisting of soybean, kaoliang, and millet, and sweetpotatoes were added to the diet. The replacement of only part of the wheat flour by the mixed flour, with the addition to the diet of small amounts of meat, cabbage, bean curd, and spinach gave a coefficient of 70 percent. The retention of nitrogen averaged 2.9 g per day on intakes between 16.85 and 17.21 g, and was lowest when the boys were eating the diet containing mixed flour bread and sweetpotatoes. The calcium retention on intakes between 0.929 and 1.508 g averaged about 0.4 g, which was increased approximately one and one-half times when the diet contained additional vegetables. The retention of phosphorus was about 2 g per day regardless of the phosphorus intake, which varied between 3.247 and 4.095 g.

The effect of body stores on the efficiency of calcium utilization, K. V. Rottensten (*Biochem. Jour., 32 (1938), No. 8, pp. 1285–1292*).—In the first series of experiments calcium and phosphorus balances were made during a 4-week preliminary period and a 5-week test period on six 30- to 33-day-old male rats receiving a diet consisting of yeast 5 percent, casein 5, wheat gluten 15, cornstarch 60, butterfat 12, and salt mixture 3 percent supplemented by additional salts to give a total calcium content of 0.15 percent in the diet of one rat and 0.8 percent in the diet of the paired mate during the 28-day preliminary period and 0.4 percent in the diets of both rats during the 35-day test period, and a phosphorus content of 0.4 percent in both periods. In the second series on six 33-day-old male rats, the calcium content of the diet was adjusted to 0.25 percent, and the preliminary and test periods were reduced to 3 weeks each. At the end of the test period the carcasses were analyzed for calcium and phosphorus.

In the first preliminary period the rats on the low calcium intake stored from 143 to 234 mg of calcium and from 133 to 235 mg of phosphorus and during the test period from 916 to 933 mg of calcium and 567 to 603 mg of phosphorus, as compared to from 500 to 671 mg calcium and from 248 to 351 mg phosphorus stored by the rats on the high calcium diet in the preliminary period and from 492 to 710 mg calcium and from 425 to 496 mg phosphorus in the test period. In the second preliminary period the rats on the low calcium diet stored from 203 to 226 mg calcium and from 148 to 167 mg phosphorus and in the test period from 497 to 532 mg calcium and from 370 to 406 mg phosphorus, as compared to from 507 to 609 mg calcium and from 238 to 310 mg phosphorus stored by the rats on the low calcium diet in the preliminary period and from 434 to 493 mg calcium and from 360 to 405 mg phosphorus in the test period. It is concluded that the degree of calcium saturation affects the efficiency of calcium utilization, the efficiency being greater with depleted than with replenished stores of body calcium.

The effect of roughage on the calcium balance in rats, W. H. Adolph, C. H. Wang, and A. H. Smith (*Jour. Nutr., 16 (1938), No. 3, pp. 291–297*).—Two series of feeding tests were made, one in America and one in China, with rats receiving calcium-poor diets with and without 25 percent regenerated calcium-free cellulose as a source of roughage and sufficient calcium lactate to provide from 40 to 50 mg of calcium per day, with a calcium: phosphorus ratio of 1.2:1.

The addition of cellulose produced only a slight increase in the excretion of fecal calcium and phosphorus in the rats on the calcium-supplemented diet and no increase in the rats on the calcium-poor diet.

A comparison of sodium fluoride in the drinking water with similar levels of cryolite in the diet on the fluorine content of the body, S. Marcovitch and W. W. Stanley. (Tenn. Expt. Sta.). (*Jour. Nutr., 16 (1938), No. 2, pp. 173–181, fig. 1*).—In continuation of previous studies (E. S. R., 78, p. 889), the authors present further evidence that the retention by rats of fluorine is approximately double when the drinking water contains 4 p. p. m. of fluorine in the form of sodium fluoride than when the same amount is given as a synthetic cryolite in the diet. The rato of fluorine: calcium was 1: 573 in newborn rats, 1: 1,598 in 29-day-old rats, and 1: 4,832 in 90-day-old rats as compared to 1: 1,428 for 90-day-old rats receiving cryolite in the diet and 1: 749 for those receiving sodium fluoride in the drinking water. The female experimental rats had a significantly greater retention of fluorine than the males, but no significant differences were noted between male and female control rats.

In fluorine determinations on samples of human urine, two adults had values of 1.8 and 1.9 p. p. m., respectively, and one 6-year-old boy 0.37 and one 7-year-old boy 0.48 p. p. m.

A comparison of ferrous and ferric iron in the nutrition of the rat, E. J. Underwood. (Wis. Expt. Sta.). (*Jour. Nutr., 16 (1938), No. 3, pp. 299–308*).—Two groups of rats rendered anemic by the method of Elvehjem and Kemmerer (E. S. R., 67, p. 90) were fed 35 cc of whole milk per day for 2 weeks and 45 cc for the remainder of a 5-week period, supplemented by 0.05 mg copper and 0.3 mg iron in the ferric or ferrous form. The total intake of available iron was 0.38 g per day, assuming the iron in milk to be 100 percent available. In another series, one rat in each of seven pairs was given 0.25 mg of iron in the ferric or ferrous form as supplement to a 4 9 g intake of a solid diet consisting of white corn 12 percent, sucrose 57, egg albumin 10, purified casein 8, butterfat 7.5, liver extract powder 1.5, and salts 4 percent, supplemented by vitamins A, B_1, and D. The total iron content of the diet ranged from 0.027 to 0.03 mg per gram. The total intake of available iron was 0.3 mg and of copper 0.1 mg per day.

The rats on the milk diet made an average increase in hemoglobin level of 6.08 g per 100 cc and in body weight of 21 g, and stored in the liver 0.38 and 0.26 mg of iron per gram of dry weight on the ferric and ferrous iron supplements, respectively, as compared to an increase of 3.4 g in hemoglobin level and 11 g in body weight, with mean liver storages of 0.21 and 0.2 mg per gram on the ferric and ferrous iron supplements, respectively, for the rats on the solid diet. It appears that the two forms of iron were equally effective on both types of diet, although the iron was much better utilized on the milk than on the solid diet at similar levels.

Radioactive iron and its metabolism in anemia, P. F. Hahn, W. F. Bale, E. O. Lawrence, and G. H. Whipple (*Jour. Amer. Med. Assoc., 111 (1938), No. 25, pp. 2285, 2286*).—In a preliminary study four anemic and three normal dogs were given ferric chloride or sulfate containing radioactive iron prepared from the isotope by deuteron bombardment. The absorption of the iron so labeled was followed by analyses of the circulating blood fractions and the liver, spleen, and marrow. The anemic dogs on a diet low in iron and depleted of their iron stores by frequent bleeding absorbed between 4.1 and 12.7 percent of the total iron intakes as compared to from 0.08 to 0.24 percent for the normal dogs with the well-filled iron stores. It would appear that in these experimental dogs the absorption of iron was dependent on the needs of the body for iron.

Value of an increased supply of vitamin B_1 and iron in the diet of children, III, P. Summerfeldt and J. R. Ross (*Amer. Jour. Diseases Children, 56 (1938), No. 5, pp. 985–988, figs. 3*).—In continuation of previous studies (E. S. R., 74, p. 133), the authors added 2 or 3 oz. of the special cereal mixture to the institutional diets of different groups of children. In one series the special cereal was given to one group of 12 children and the ordinary cereals to another group of 13 comparable children for 1 yr. In a second series 14 children were given the special cereal and 12 the ordinary cereals for 18 mo., and in the third series 13 children were given the special cereal for 7 mo. after 17 mo. on the diet containing the ordinary cereals. In the final series 19 children received the ordinary cereals for 6 mo., the special cereal for 6 mo., and the ordinary cereals for another 6-mo. period.

The addition to the diet of the special cereal supplying about 18 mg additional iron per day and large amounts of the vitamin B complex markedly increased the rate of gain in weight and the hemoglobin level in the children. When the ordinary cereals replaced the special cereal in the diet the rate of gain in weight and the hemoglobin level fell at a gradual rate.

The therapeutic properties of the vitamins [trans. title], A. Szent-Györgyi (*Presse Méd. [Paris], No. 51 (1938), p 995*).—According to the author the discovery and synthesis of some of the vitamins and their successful use in large quantities in the treatment of various widely different diseases have fundamentally changed the conception of the function of the vitamins. This point is clarified by a discussion of vitamin C. Scurvy is not the first sign of a deficiency of this vitamin but a very late premortal syndrome. The smallest amount of the vitamin on which no visible symptoms are produced keeps the body perfectly healthy in appearance, and an insufficiency of the vitamin manifests itself only if the body has a considerably more than ordinary task to perform. The result of this insufficiency may then be any one of a number of diseases, the course of which may be influenced favorably by the administration of the vitamin. It is generally accepted that a caged guinea pig protected against infections can be maintained in apparently perfect health on from 1.5 to 2 mg of ascorbic acid, but that its resistance to diphtheria toxin can be greatly increased by considerably larger doses of the vitamin and that 10 times the minimum protective dose is required for saturation of the tissues. Furthermore, in its natural environment the guinea pig consumes daily from 100 to 120 g of green food, furnishing from 20 to 40 mg of vitamin C. This is about the same amount as required for saturation of the tissues and probably represents the quantitative requirement for perfect health. In general terms it is considered that the physiological quantity of any vitamin is that which in its ordinary environment the organism in question would absorb daily. This quantity will assure a maximum resistance against infection and the regular functioning of the organism.

Report of the use of biophotometer and vitamin A therapy in industry, O. H. SCHETTLER, R. F. BISBEE, and B. H. GOODENOUGH (*Jour. Indus. Hyg. and Toxicol., 21 (1939), No. 2, pp. 53–55, figs. 2*).—A preliminary report is given of the application of the biophotometer to the detection of vitamin A deficiency in workers engaged in matching the whiteness of porcelain used in electric ranges and refrigerators in artificial light of an intensity 50 times the average light in schoolrooms or 10 times that found in industrial inspection. Subjects showing vitamin A deficiency were given carotene in oil to the extent of 30,000 units of vitamin A daily. Improvement in biophotometer readings was followed by greater eye comfort, improvement in general health, and better results in the matching tests.

Effect of avitaminosis A on the blood picture of albino rats, O. D. ABBOTT and C. F. AHMANN. (Fla. Expt. Sta.). (*Amer. Jour. Physiol., 122 (1938), No. 3, pp. 589–595, figs. 2*).—The blood picture was studied in about 200 young rats during recovery periods following vitamin A depletion and in about 100 adult female rats maintained on a low vitamin A diet.

When the young rats were about 6 weeks old and had been on the vitamin A-deficient diet for approximately 3 weeks, the leucocyte count increased from 7,400 to 9,200 per cubic millimeter and the neutrophile polymorphonuclears from 22 to 42 percent and the lymphocytes decreased from 70 to 50 percent. By the fifth week 74 percent of the white cells were polymorphonuclears and 12 percent were lymphocytes. From 2,500 to 3,000 U. S. P. units of vitamin A were given over a 4-day period and in about 6 weeks the polymorphonuclears: lymphocytes ratio had returned to normal. When the rats were again depleted of vitamin A the leucocyte count decreased to about 3,000 and the percentage of polymorphonuclears dropped until at the eighteenth week it was only 8 percent of the total count, while the juvenile forms, stabs, myelocytes, and myeloblasts increased and constituted 21 percent and the lymphocytes 32 percent of the total count. The administration of carotene to the rats surviving after from 18 to 19 weeks increased the polymorphonuclears to 45 percent and the young forms to 20 percent within about 17 days.

The blood picture of the vitamin A-deficient adult rats remained unchanged for about 2 mo. and then showed an increase in polymorphonuclears and large lymphocytes. At about 5½ mo. the average differential count was polymorphonuclears 10 percent, juvenile forms 6, stabs 8, small lymphocytes 6, large lymphocytes 60, and unclassified 10 percent of the total count. Three weeks after the administration of carotene the blood picture returned to normal except for a high percentage of large lymphocytes which persisted after the disappearance of any physical signs of vitamin A deficiency.

The riboflavin content of meats, W. J. Darby and P. L. Day. (Univ. Ark.). (*Jour. Nutr., 16 (1938), No. 3, pp. 209–218, figs. 3*).—In continuation of previous studies (E. S. R., 80, p. 569) and using the rat growth method, the authors found the biologically active riboflavin content of various meats to be as follows: Pork liver 9.2, fresh ham 1.2, lamb chops 1.1, cured ham 0.81, beef brisket 0.74, and bacon 0.36 rat units of riboflavin per gram of meat. In terms of the biologically equivalent amount of crystalline riboflavin, the values are 23, 3, 2.8, 2, 1.9, and 0.9 μg of riboflavin per gram, respectively.

The vitamins of the B group according to the present status of research [trans. title], F. Laquer (*Ztschr. Vitaminforsch., 7 (1938), No. 3–4, pp. 334–367*).—This extensive review of the literature covers the chemical constitution and synthesis, methods of determination, physiological behavior in the animal body, occurrence in nature, and clinical applications of vitamin B_1 (aneurin, thiamin); the vitamins of the B_2 group including the chemical constitution and synthesis of lactoflavin (*d*-riboflavin), its relation to the Warburg yellow ferment and its biological significance and occurrence in nature, pellagra and nicotinic acid, vitamin B_6 (which is termed adermin), the somewhat doubtful factors B_3, B_5, B_4, Y, R, W, and B_7, and further liver constituents, vitamin H (György), and alitoxin; bios and similar factors; and the general significance of the B vitamins, particularly as components of the ferment systems which are responsible for the disintegration of food materials and their oxidation in the cells. More than 350 literature references are appended.

Our vitamin B_1 supply in relation to human needs, R. R. Williams (*Bul. N. Y. Acad. Med., 2. ser., 14 (1938), No. 10, pp. 641–646*).—A brief review of recent developments concerning the physiological role of thiamin in the form of its pyrophosphate as a coenzyme for the metabolism of pyruvic acid in the intermediary metabolism of carbohydrates is followed by a classification of foods from the standpoint of their richness in thiamin and the presentation of a new formula for the calculation of thiamin requirements. Analyses of 70 diets associated with histological outbreaks of beriberi and about 30 associated with the absence or recession of the disease showed that at the borderline between beriberi and nonberiberi the value of the thiamin content in micrograms divided by the nonfat caloric content of the diet was constant at about 0.3. Accepting the theory that the required proportion of thiamin to nonfat calories of the food is substantially constant for all species and weights, the quantity of fat and the quantity of thiamin required per unit of body weight is considered to rise in a general way as the weight falls whether from species to species or within a species approximately in proportion to weight $^{3/8}$. The human requirement for the prevention of beriberi is considered to be about 1 mg for each 3,700 nonfat calories. For diets containing large proportions of starch and small proportions of fat, the minimum daily requirement of thiamin per adult is estimated to be about 0.6 mg, or roughly 200 International Units per day for a 2,500 total calorie intake. It is emphasized in conclusion that if thiamin constitutes a necessary mechanism for all cells, an increase in its supply may result in improved functional performance of whatever organ may be operating at low efficiency.

Untoward effects resulting from the use of large doses of vitamin B_1, C. L. Steinberg (*Amer. Jour. Digest. Diseases, 5 (1938), No. 10, pp. 680, 681*).—

Three patients with chronic arthritis receiving between 1,200 and 4,800 International Units of vitamin B_1 orally and parenterally per day for from 4 weeks to 6 mo. developed severe burning pains in localized areas which were diagnosed as the typical lesions of herpes zoster. The cessation of vitamin B_1 treatment resulted in complete disappearance of the herpetiform lesions in from 3 to 8 weeks. In one patient a return to the vitamin B_1 therapy produced a recurrence of the symptoms. The evidence of a toxic symptom is reported for about 1 percent of a series of 300 patients given vitamin B_1 therapy by the author.

Effect of vitamin B_1 and vitamin B_2 complex on the loss of weight produced in rats by experimental hyperthyroidism, V. A. DRILL (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 2, pp. 313–316*).—In addition to the findings previously reported (E. S. R., 80, p. 563), the author presents further data to show that the administration of vitamin B_1 and the vitamin B_2 complex to hyperthyroid rats enabled the female rats to regain weight lost during the period of ingesting 100 mg. of thyroid gland daily. A similar response was shown in the male rats when the dosage of thyroid gland was 50 mg. per day.

The chemical determination of lactoflavin (vitamin B_2) [trans. title], A. EMMERIE (*Ztschr. Vitaminforsch., 7 (1938), No. 3–4, pp. 244–253*).—A brief review is given of the literature on the discovery and naming of lactoflavin, its chemical and physical properties and occurrence, methods for its extraction from various materials and its purification, and the use of the Pulfrich-Zeiss step photometer for its determination. The author's own technic for the determination of the lactoflavin content of liver, milk, bread, and cheese is described in detail, and the values obtained are incorporated in a compilation of values as determined by biological and chemical methods.

Determinations of lactoflavin and flavin phosphoric acid in human urine under various conditions are also reported. In the normal urine of two subjects the content of flavin phosphoric acid amounted to from 50 to 60 percent of the total flavin. After the consumption of free flavin the urine showed a greatly increased content of free flavin but very little change in flavin phosphoric acid. Following the consumption of phosphoric acid flavin there was an increased excretion of both components, with free flavin in excess of phosphoric acid flavin. It is stated in conclusion that the human requirement of flavin has not yet been established, but is probably less than 3 mg. daily for an adult, as on this amount added to a flavin-low diet a heightened excretion takes place.

Vitamin B_2 hypervitaminosis [trans. title], F. WIDENBAUER and H. E. WEDEMEYER (*Ztschr. Vitaminforsch., 7 (1938), No. 3–4, pp. 322–325; Fr., Eng. abs., p. 325*).—Lactoflavin administered subcutaneously in doses of from 0.15 to 1 mg., and in one instance 2 mg., daily to 11 rats from 4 weeks to 1½ yr. of age over a period of from 17 to 36 days was found to have no ill effects, and on autopsy none of the organs showed damage on histological examination. The authors conclude that alleged injuries on large doses of lactoflavin reported in the literature were probably due to the solvents used rather than the lactoflavin itself.

Fatty livers in vitamin B_6 deficient rats, N. HALLIDAY (*Jour. Nutr., 16 (1938), No. 3, pp. 285–290*).—The livers of 41- to 66-day-old rats maintained on the vitamin B_6-deficient diet, as described in a previous report (E. S. R., 78, p. 570), contained from 55 to 78 mg. of total fatty acids per gram as compared to from 22.8 to 34.6 mg. in the livers of 23- to 60-day-old normal rats and from 35.2 to 38.6 mg. in the livers of 61- to 66-day-old rats receiving the deficient diet supplemented by 40 or 220 mg. of choline. The livers of the vitamin B_6-deficient rats varied in weight from 53 to 59 mg., of the normal rats from 35.4 to 41 mg., and of the deficient rats receiving choline from 44.2 to 46 mg. per gram of rat. The phospholipid fatty acids and the cholesterol contents of the livers of all animals were essentially the same, but the iodine numbers were lower in the livers of the more mature rats.

Vitamin C content (*Colorado Sta. Rpt. 1938, p. 27*).—Progress is reported on exploratory work on the vitamin C content of fruits and vegetables grown at high and low elevations.

Vitamin C content of Hungarian vegetables [trans. title], J. BECKER (E. BECKER) (*M. Kir. Kertész. Tanint. Közlem.* (*Bul. Roy. Hung. Hort. Col.*), *4* (*1938*), *pp. 41–47, figs. 6; Eng. abs, p. 46*).—The following values are given as determined biologically: Red radish 50 mg per 100 g, onion 25, white radish 25, pepper 300, lettuce 10, cucumber 8, red beet 5, red cabbage 100, cabbage 50, cauliflower 100, kale 100, kohlrabi 100, spinach 50, peas 25, beans 15, pumpkin 5, tomato 30, and potato 12 mg per 100 g.

The ascorbic acid content of celery, R. A. OSTERMAN. (Cornell Univ.). (*Jour. Home Econ., 30* (*1938*), *No. 10, pp. 715, 716*).—Using the Mack and Kertesz modification (E. S. R., 77, p. 151) of the indophenol titration method, the author found that the outer stalks of green raw Utah celery contained from 4.26 to 7.66 mg of ascorbic acid, inner stalks from 7.27 to 8.58, juice of stalks from 1.05 to 1.26, and leaves from 22.16 to 31.25 mg as compared to from 4.57 to 4.98 mg, from 6.49 to 9.35, from 0.72 to 0.78, and from 14.55 to 29.52 mg of ascorbic acid per 100 g, respectively, for white raw California celery. After 15 min. of boiling in water, the stalks of the Utah celery contained from 2.7 to 4.73 mg per 100 g and the cooking water from 1.74 to 3.99 mg, indicating a loss of 10 percent and a transfer to the cooking water of about 40 percent of the ascorbic acid present in the raw celery stalks.

The cause of loss of vitamin C from bottled tomato juice, D. K. TRESSLER and K. M. CURRAN. (N. Y. State Expt. Sta.). (*Jour. Home Econ., 30* (*1938*), *No. 7, pp. 487, 488*).—In this preliminary study the Bessey and King modification (E. S. R., 71, p. 137) of the indophenol titration method was followed in determining the ascorbic acid content of three samples of tomato juice which had been extracted, preheated at 160° F. in a commercial plant, and then rapidly heated in open flasks to 185° and put into pint bottles filled to three levels—entirely full, within 2.5 cm of the top, and to the shoulder (leaving a head space of 11.5 cm). The bottles were crowned immediately, cooled, and stored in the dark at room temperature. After cooling, the head spaces in the three types of fill were about 12, 20, and 130 cc, respectively.

After 1 day of storage the ascorbic acid content of the samples had decreased from the original content of 0.21 mg per gram of fresh tomato to 0.19, 0.17, and 0.115 mg, respectively, in the three types of fill as compared to 0.195 mg for a completely full sample of commercially canned tomato juice. After 40 days of storage the completely filled bottled product contained 0.165 mg, the sample with 2.5 cm head space 0.145, and with 11.5 cm head space 0.065 and the completely filled canned product 0.17 mg. After 230 days of storage the values obtained were 0.17, 0.15, 0.035, and 0.165 mg of ascorbic acid per gram of juice, respectively, indicating that very little loss occurred after 40 days of storage in either the bottles or cans which were completely filled with hot juice.

Seasonal and other variations in the elimination of vitamin C in the urine [trans. title], H. MÜLLER (*Ztschr. Vitaminforsch., 7* (*1938*), *No. 3–4, pp. 311–322, figs. 4; Ger., Eng. abs., pp. 321, 322*).—The 14 subjects of this long-continued investigation were patients in a lacto-ovo-vegetarian clinic in Switzerland. Six of them were studied for an entire year, thus affording seasonal comparison. The general plan was to determine the 24-hr. excretion for from 2 to 6 days on the regular diet and then for about 4 days on the same diet supplemented with 200 or 300 mg of ascorbic acid, administered in two or three doses. The standard for saturation was the elimination on the first or, at the latest, the second day of at least 70 percent of the daily supplement of ascorbic acid. An elimination of from 20 to 50 mg of ascorbic acid daily on an unsupplemented diet was considered normal.

During the winter months the ascorbic acid eliminated on the unsupplemented diets ranged from 9 to 23 mg with the exception of 3 subjects who subsisted chiefly on a raw vegetable and fruit diet and whose average ascorbic acid excretion in November was 55 mg. After the addition of four mandarins to the diet the value rose to 125 mg. It is noted that 150 g of cooked brussels sprouts produced the same increase in ascorbic acid excretion as four mandarins or two oranges of medium size. In June the ascorbic acid excretion on the unsupplemented diets rose abruptly, averaging 48 mg daily in comparison with 17 mg in May. This is attributed to the large consumption during June of cherries, strawberries. and green salads. The average fell to 27 mg in July, rose to 35 mg in August with the beginning of the season for plums and tomatoes, and fell again in September to 21 mg.

Only in the months of June to September were any of the subjects saturated according to the standard adopted. The prompt changes in daily excretion with changes in diet are thought to demonstrate the futility of trying to build up sufficient reserves to carry over a long period on a deficient diet. It is considered much more rational to provide constantly a sufficient amount of vitamin C to give a daily elimination of about 50 mg. A lacto-ovo-vegetarian diet is unable to prevent vitamin C deficiency if it does not contain a considerable amount of raw fruits and vegetables and some cooked vegetables such as cabbage or brussels sprouts and potatoes. In the author's observations winter deficiency of vitamin C, so frequent in Switzerland, diminishes the resistance of the individual and favors the appearance of illnesses in the spring.

Minimal vitamin C requirements of artificially fed infants: A study of four hundred and twenty-seven children under a controlled dietary regimen, B. M. Hamil, L. Reynolds, M. W. Poole, and I. G. Macy (*Amer. Jour. Diseases Children, 56* (*1938*), *No. 3, pp. 561–583, fig. 1*).—This report is based upon an analysis of vital phenomena related to subclinical scurvy according to Park's criteria obtained in a detailed study of over 400 infants selected to represent a cross section of the infants of indigent or near indigent parents in Detroit. The infants, 80 percent of whom were studied for 9 mo. or longer during their first year of life, were kept at home under close supervision. For the most part their vitamin C intake approximated 10 mg per day, the sole source of which was a commercially decitrated lemon juice.

Of the 427 infants known to have received vitamin C supplement throughout the study, only 21 were diagnosed as having had scurvy, and in mild degree, at some time or other during the period of the observations. Accompanying, and in a few cases preceding the scurvy as diagnosed roentgenographically, were retardations of rates of gain in weight and height but not of development in sitting, standing, creeping, walking, or talking, nor alterations in hemoglobin. Moderate or slight infections were present in 18 of the infants, with roentgen evidence of mild scurvy. Coincident with the disappearance of scurvy during the constant intake of vitamin C, the symptoms of infection disappeared.

No reliance could be placed on the capillary resistance test, and no indication was found that a lowered hemoglobin is any more a symptom of scurvy than a predisposing factor in its development. It is emphasized that the condition which has usually been considered latent scurvy is actually definite mild scurvy. "It seems that scurvy is a definite pathologic entity but does not become evident or retard development until the absence of the specific physiologic functions of the vitamin is manifest." From these observations the authors conclude that the minimal protective dose of vitamin C for the average healthy infant is about 10 mg per day.

The relation between plasma ascorbic acid concentration and diet in the newborn infant, R. L. MINDLIN (*Jour. Ped., 13 (1938), No. 3, pp. 309–313*).—Values are reported for the content of reduced ascorbic acid determined by the microcolorimetric method of Mindlin and Butler noted on page 728 of 50 normal full-term infants selected for the study at the age of 2 weeks and divided into three groups, depending upon their feedings. Minimum, maximum, and average values for the ascorbic acid content of the blood plasma were as follows: Group 1, consisting of 21 infants satisfactorily nursed at the breast and tested on the thirteenth or fourteenth day of life, 0.8, 1.6, and 1 mg ascorbic acid per 100 cc, respectively; group 2, consisting of 19 infants entirely breast-fed for the last 4 or more days before testing at ages ranging from 8 to 20 days, 0.1, 0.7, and 0.3 mg per 100 cc; and group 3, of 10 infants artificially fed as in group 2 but given daily supplements of 20 mg (3 subjects), 30 mg (3 subjects), and 75 mg (4 subjects) of ascorbic acid, 0.4, 0.8, and 0.6 mg per 100 cc, respectively. The authors conclude that for optimal nutrition infants who are given pasteurized artificial feedings from birth should receive a daily supplement of ascorbic acid from the beginning rather than after 2 or 3 mo.

Vitamin C metabolism in pathological cases [trans. title], A. GÓTH (*Ztschr. Vitaminforsch., 7 (1938), No. 3–4, pp. 326–333, figs. 4; Fr., Eng. abs.*, p. *333*).—A classification of hypovitaminoses is first presented. The causes of absolute hypovitaminosis are classified as deficient nutrition, disturbance in resorption, destruction of the vitamin, and antagonistic action between the vitamins and other substances. Relative hypovitaminosis is the result of increased requirements, such as growth, pregnancy, and one-sided diet. Saturation tests conducted on a group of 40 subjects suffering from various pathological conditions indicated that increased oxidation plays no part in the C-hypovitaminosis of febrile conditions, for in artificial fevers no deficiency could be detected; that in Addison's disease there is a real decrease in excretion of ascorbic acid; that there is no connection between allergic diseases and ascorbic acid requirements; and that vitamin C is effective in hemorrhages only in those which occur during a condition of hypovitaminosis.

Effect of absolute and partial vitamin C deficiency on healing of wounds, M. TAFFEL and S. C. HARVEY (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 4, pp. 518–525, figs. 2*).—A series of guinea pig experiments undertaken to determine the effect of absolute and partial vitamin C deficiency on the rate of healing of artificially produced stomach wounds during the first 14 days after operation is reported, with the finding that in absolute scurvy a significant increase in strength of the wound in comparison with that of controls receiving vitamin C was apparent at the fourth post-operative day, but a marked decrease at the sixth day. In explanation of the early increase, it is suggested that the absolute deficiency may in some way act as a stimulus for the increased proliferation of fibroblasts in the very early stages of healing. In the animals on the diet partially deficient in vitamin C a decrease in strength of the wound was apparent in animals sacrificed at 8 and 10 days. In others sacrificed at 12 and 14 days the values appeared normal.

These results are thought to confirm the theory that vitamin C deficiency in man, even when partial, may be one of the major causative factors in cases of wound disruption where there is no evidence of infection of the wound but where the patients for one reason or another have been on inadequate diets.

Claim for thyroid subnormality in vitamin E-low rats, I. R. Telford, G. A. Emerson, and H. M. Evans. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 5, pp. 623, 624*).—The authors note briefly that the young of vitamin E-low mothers and adult rats on the vitamin E-low diet 427 showed no histological evidence of hypothyroidism.

What is vitamin P? (*Brit. Med. Jour., No. 4065 (1938), pp. 1152, 1153*).—This editorial comment on the controversial subject of the existence of vitamin P (E. S. R, 77, p. 740) reviews the literature and closes with the statement that at present "it seems to be less a question of whether vitamin P really exists than of what vitamin P really is."

The pathological responses to vitamin deficiencies, G. Dalldorf (*Bul. N. Y. Acad. Med., 2. ser., 14 (1938), No. 10, pp. 635–640*).—Vitamin A and vitamin C are used to illustrate modern studies of vitamin deficiency from an anatomical point of view. By the application of pathological criteria, evidence of infection in vitamin A deficiency has been shown to be secondary to metaplasia of the epithelium, with its replacement by keratinized cells which accumulate in various ducts and obstruct the flow of secretions, thus paving the way for infections. The specificity of epithelial metaplasia has been demonstrated in animals by testing the relative influence of vitamin A deficiency, theelin, and mechanical irritation in producing metaplasia. With a high vitamin intake neither mechanical irritation nor theelin dosage produced metaplasia, but more of the vitamin was needed to prevent metaplasia in animals given theelin or subjected to mechanical irritation. It is also noted that patients with renal calculus often have night blindness, which in most instances is not cured by prolonged administration of massive doses of vitamin A. It is suggested that such persons have an irreversible form of vitamin A deficiency.

Attention is called to the function of vitamin C in the maintenance of the skeletal structures through being responsible for the setting to a gel of the intercellular material. Evidence in support of the belief that the vitamin C requirements of individuals suffering from infectious diseases are abnormally high is given in the report that the degeneration and fragmentation of the skeletal muscles in scurvy is probably identical with Zenker's degeneration often noted in patients with typhoid fever and influenza. The possibility is suggested that the older practice of feeding to patients with infectious diseases gruel and broth may, with the high vitamin requirements of these diseases, have precipitated Zenker's degeneration by precipitating scurvy.

Multiple nature of the deficiency of blacktongue-producing diets as shown by studies on rats, O. M. Helmer and P. J. Fouts (*Jour. Nutr., 16 (1938), No. 3, pp. 271–277, fig. 1*).—In continuation of previous studies (E. S. R., 79, p. 140), the authors fed to rats previously maintained on a riboflavin-free diet the Goldberger blacktongue-producing diet No. 195. Unsupplemented, their average weekly gain over a 6-week period was 7.4 g. For rats receiving as supplements 1 mg nicotinic acid, 0.5 cc purified liver extract containing the chick antidermatitis factor and nicotinic acid, and 40 μg riboflavin the corresponding gain was 19.5 g; for rats receiving 200 g powdered liver extract 18.4; for rats receiving purified liver extract and riboflavin 16.3; for rats receiving purified liver extract 10.1; for rats receiving riboflavin and nicotinic acid 9.2; for rats receiving riboflavin 7.9; and for rats receiving nicotinic acid as supplement to the blacktongue-producing diet 5.3 g. The results demonstrate that the blacktongue-producing diet does not contain sufficient riboflavin, chick antidermatitis factor, or nicotinic acid to promote normal growth in rats.

The effect of various fractions of liver on experimental canine blacktongue, H. I. Harvey, D. T. Smith, E. L. Persons, and M. V. Burns (*Jour. Nutr., 16* (*1938*), *No. 2, pp. 153–171, figs. 4*).—In continuation of previous studies (E. S. R., 78, p. 896), the results of feeding various portions of liver extract to 45 dogs during about 150 attacks of blacktongue are presented to indicate that the two substances present in aqueous extract of liver are both necessary for the liberation of a compound, probably a nicotinic acid complex, which is potent in the cure of experimental blacktongue in dogs and pellagra in man.

Galactose cataract in rats: Factors influencing progressive and regressive changes, H. S. Mitchell and G. M. Cook. (Mass. Expt. Sta.). (*Arch. Ophthalmol., 19* (*1938*), *No. 1, pp. 22–33, figs. 4*).—The experimental studies on galactose cataract previously reported (E. S. R., 78, p. 571) are reviewed under the susceptibility of different breeds of rats to galactose cataract, the influence of protein and of other factors in the ration, and the stages of development and regression of the cataract.

Effect of riboflavin and thiamin chloride upon the cataractogenic action of galactose, H. S. Mitchell and G. M. Cook. (Mass. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 39* (*1938*), *No. 2, pp. 325, 326*).—In continuation of the study noted above, the authors gave 50 µg riboflavin and 20 µg thiamin chloride to rats receiving a ration consisting of galactose 25 percent, cornstarch 45, vitamin-free casein 15, salt mixture 4, Crisco 9, and cod-liver oil 2 percent and 2 drops of tikitiki daily to provide the filtrate factor. Cataract developed rapidly in all groups, with no significant differences in rate or incidence. It is concluded that massive doses of riboflavin or thiamin chloride exert no protective action against the development of galactose cataract in rats.

A reaction to the oral administration of nicotinic acid, W. H. Sebrell and R. E. Butler (*Jour. Amer. Med. Assoc., 111* (*1938*), *No. 25, pp. 2286, 2287*).—From tests made on 18 healthy adult women maintained on a 2,400-calorie diet low in the pellagra-preventive vitamin and receiving 10-, 30-, or 50-mg doses of nicotinic acid in 120 cc of tomato juice per day for periods up to 92 days, it is concluded that unpleasant reactions to the nicotinic acid are to be expected in some individuals receiving as low as 30 mg by mouth. Since the reactions persist only a short while and there is no evidence that they are harmful, the authors recommend that their occurrence should not interfere with the therapeutic use of large doses of nicotinic acid.

Nicotinic acid in the treatment of acrodynia, F. F. Tisdall, T. G. H. Drake, and A. Brown (*Jour. Ped., 13* (*1938*), *No. 6, pp. 891–893*).—The administration of from 20 to 80 mg of pure nicotinic acid or the monoethanolamine salt of nicotinic acid by intravenous or intramuscular injection or of from 100 to 125 mg of nicotinic acid by mouth to six infants with typcal symptoms of acrodynia tended to hasten the healing of the skin lesions but had no demonstrable effect on the clinical course of the disease as a whole.

Nicotinic acid for pellagra (*Brit. Med. Jour., No. 4049* (*1938*), *pp. 353, 354*).—In a brief note on the discovery of nicotinic acid as the pellagra-preventive factor for man, it is pointed out that the discovery exemplifies the progress made by the continuous effort put forth in the biological laboratory to demonstrate the presence of the factor, its identification by chemical analysis, and finally the application of the findings by the clinician to the relief of human suffering.

Differentiation of the rat dermatitis factor and the chick dermatitis factor from nicotinic acid, W. J. Dann and Y. Subbarow (*Jour. Nutr., 16* (*1938*), *No. 2, pp. 183–195, figs. 2*).—Essentially noted from a preliminary report (E. S. R., 78, p. 896).

Comparative value of cod-liver oil and an emulsion of percomorph-liver oil in the prevention of rickets, M. R. Reynolds (*Jour. Ped, 12 (1938), No. 6, pp. 789–793*).—The author reports that the administration between October and June of 450 U S. P. XI vitamin D units in the form of percomorph-liver oil in a malt emulsion prevented rickets in 65 of a group of 66 infants averaging 14 days of age at the beginning and 7.1 mo. at the end of the test period. The administration of the same number of units in the form of cod-liver oil to a group of 60 infants prevented rickets in 57 cases. About one-third of the infants were breast fed for 5 mo. or longer and were given the antirachitic supplement in water or orange juice, while the remainder of the group took it in the milk formula or directly from the spoon, the supplement being equally effective regardless of the method of administration. The malt emulsion of percomorph-liver oil was preferred on the basis of palatability, ease of administration, and ready digestibility.

TEXTILES AND CLOTHING

The relation of certain physical fiber properties in improved cotton varieties to spinning quality, J. H. Moore. (Coop. U. S. D. A). (*North Carolina Sta. Tech. Bul. 58 (1938), pp 58*)—Varieties of American upland cotton comprising Acala 4067, Coker-Cleveland 884–4, Mexican 128, Mexican 87–8, Rowden 40, Rowden 2088, and Farm Relief No. 1 were grown near Raleigh, N. C., in 1932 and 1934 on Cecil sandy loam, and the lint was spun into yarns. Significant differences were apparent in boll weight, seed weight, and lint index but not in yields. Varieties giving the highest yarn strength yielded as well as varieties showing the lowest yarn strength. During each season cotton produced from the respective varieties showed significant differences in fiber diameter and weight, staple length, breaking load per fiber, and percentage of thin-walled fibers; and in spinning tests significant differences were indicated in the yarn strength of 23's, 30's, and 40's yarns (with twist factors of 4 25 and 4.75 to each count), but none between varieties in running quality during the several spinning processes or in appearance of yarns.

Special methods were used to analyze relations of the several fiber properties to variability in yarn strength. Higher yarn strengths were associated with a smaller fiber diameter, higher unit fiber weight, and, to a limited extent, with an increase in staple length, while increasing number of fibers in cross sections was associated with weaker yarns. Average breaking load per fiber was not definitely related to yarn strength, which also was not related significantly with total calculated breaking load of the fibers in a count of yarn. An increasing percentage of thin-walled fibers might be associated with higher yarn strength in one season and be negligible in another season

In choosing plants for breeding cotton strains having fiber properties associated with high spinning value, the breeder of American upland varieties evidently should select for longer staple length, smaller diameter, relatively high fiber weight in strains having similar small diameters, and a reasonable amount of strength.

Investigations of wool and other animal fibers (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1938, pp. 25, 26*).—The development of technic for rapid determination of fineness and variability of wool and discovery of the construction of microscopically small component parts of animal fibers are described briefly.

A study of factors affecting the service qualities of certain textile fabrics (*Kansas Sta. Bien. Rpt. 1937–38, pp. 121, 122*).—Included in this progress report (E. S. R., 78, p. 139) are studies by K. Hess, E. Nelson, and H. Fletcher on the methods of measuring the absorptive qualities of certain fabrics, service qualities of fabrics as affected by laundering, and the effects of laundering silks with various soap flakes.

HOME MANAGEMENT AND EQUIPMENT

[Family economics studies by the Arkansas Station] (*Arkansas Sta. Bul. 368 (1938), pp. 70, 71*).—Progress reports are given by I. C. Wilson and O. J. Hall on cash receipts and proportion of family income represented in home industries and by Wilson on expenditures of Arkansas farm families as determined by analyses of home account books.

Standard of living on Carroll County Maryland farms, V. C. Teeter and C. B. Smith (*Maryland Sta. Bul. 422 (1938), pp. 85–119, figs. 7*).—Data on annual income and expenditures and on food consumption for 1 week were collected in the summer of 1937 by personal interview and the use of a questionnaire from 72 farm families with incomes ranging from $440 to $5,104 a year. The average size of family was 4.3 persons and the household averaged 5.1 persons.

The total cash receipts averaged $2,769, of which $1,370 or 49.5 percent was used for farm operation expense, $1,032 or 37.3 percent for family living expense, and $367 or 13.2 percent was accumulated for savings, investments, or other purposes. Of the living expense, 29.3 percent went for household and operation, 29.2 for food, 15.2 for clothing, 13.3 for advancement and recreation, 7.7 for health, and 5.3 percent for personal expense. Every family had an automobile and 90 percent had sewing machines, 89 percent radios, 81 percent water indoors, 78 percent mechanical washing machines and central lighting, 64 percent telephones, 58 percent hot and cold water, 57 percent central heating, and 56 percent indoor toilets.

A discussion is included of the adequacy of the diets as compared with proposed standards for nutritive requirements.

Surveys show consumption trends and needs (*U. S. Dept. Agr., Sec. Agr. Rpt., 1938, pp. 140–143*).—In this brief discussion of the consumer purchases study (E. S. R., 80, p. 717) selected data are given on the median incomes of farm families in different geographic regions of the United States and the patterns of consumption of farm families and employed wage earners and low-salaried workers in cities.

When you buy, M. B. Trilling, E. K. Eberhart, and F. W. Nicholas (*Chicago: J. B. Lippincott Co., [1938], pp. IX+401, [figs. 76]*).—In part 1 of this textbook for use in high school and college courses in consumer problems the consumer buying problem is explained and the consumer's predicament is discussed. In part 2 various possibilities for the solution of these problems are presented. General buying procedures are emphasized, with problems and projects which parallel the buying experiences of everyday life, and a selected bibliography is included in each chapter.

MISCELLANEOUS

Report of the Secretary of Agriculture, 1938, H. A. Wallace (*U. S. Dept. Agr., Sec. Agr. Rpt., 1938, pp. III+160*).—The principal findings in this report are noted elsewhere in this issue.

Index to publications of the United States Department of Agriculture, 1931–1935, compiled by M. A. Bradley (*U. S. Dept. Agr., 1937, pp. V+518*).—

This combined subject and author index extends that previously noted (E. S. R., 73, p. 285), continuing the same policies as to inclusiveness.

Report on the agricultural experiment stations, 1938, J. T. JARDINE, F. D. FROMME, ET AL. (*U. S. Dept. Agr., Off. Expt. Stas., Rpt. Agr. Expt. Stas., 1938, pp. 199*).—This report is discussed editorially on page 721 of this issue.

Fiftieth Annual Report [of Arkansas Station], 1938, C. O. BRANNEN ET AL. (*Arkansas Sta. Bul. 368* (*1938*), *pp. 111, figs. 17*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Agricultural research in Colorado: Fifty-first Annual Report, Colorado Experiment Station, 1937–38, E. P. SANDSTEN (*Colorado Sta. Rpt. 1938, pp. 62*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

[Biennial Report of Kansas Station, 1937–38], L. E. CALL ET AL. (*Kansas Sta. Bien. Rpt. 1937–38, pp. 145, figs. 9*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Proceedings in commemoration of the fiftieth anniversary of the Kentucky Agricultural Experiment Station, Wednesday, September 25, 1935 (*Kentucky Sta. Bul. 388* (*1938*), *pp.* [*1*]+*353–403, figs. 8*).—These anniversary proceedings have been discussed editorially (E. S. R., 73, p. 737).

The Fifty-first Annual Report of the University of Maryland Agricultural Experiment Station, [1938], J. E. METZGER (*Maryland Sta. Rpt. 1938, pp. 88, figs. 18; Bul. Sup., pp.* [*328*], *figs. 78*).—The report includes experimental work for the most part noted elsewhere in this issue. The supplement includes reprints of Bulletins 410 and 412–416, previously abstracted, and Bulletins 411 and 417–419, abstracted elsewhere in this issue.

Report of the Michigan Agricultural Experiment Station for the two years ended June 30, 1938, V. R. GARDNER (*Michigan Sta.* [*Bien.*] *Rpt. 1937–38, pp. 48*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Adjusting Montana's agriculture: Forty-fourth Annual Report of the Montana Agricultural Experiment Station, [1937], C. McKEE (*Montana Sta. Rpt. 1937, pp. 58*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Epistle to the farm: [Biennial Report of West Virginia Station, 1937–38], C. R. ORTON (*West Virginia Sta. Bul. 290* (*1938*), *pp. 53, pls. 8*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Arkansas University and Station.—Projects recently undertaken include studies of the chemical properties of Arkansas grapes; the influence of kamala and commercial preparations of thyroid, pituitary, corpus luteum, and other glands on the weight of eggs; and the physical characteristics and chemical properties of peaches to determine the extent to which they can be processed to provide a canned product of uniformly high quality.

The departments of agricultural engineering and animal husbandry are experimenting with low-cost apparatus for the use of electricity in the refrigeration of milk and other dairy and livestock products. A "wet" cooling tank will be built for experimental use at the main station, a dry refrigerator will be built and tested later, and data will be collected covering the necessary purchased equipment.

A joint research project to determine the resistance of honeybees to American foulbrood and development of resistant strains is to be conducted at the Fruit and Truck Substation near Hope in cooperation with the U. S. D. A. Bureau of Entomology and Plant Quarantine. About 150 colonies of bees will be used. Determinations will be made as to the degree of resistance to foulbrood, and those found less tolerant will be bred up in an attempt to produce a completely resistant strain. Samuel E. McGregor, junior apiculturist of the Bureau, has been assigned to conduct the work.

Dr. Hereford Garland has been appointed instructor in forestry, effective March 13, vice R. W. Hess, resigned.

Connecticut Storrs Station.—An addition to Atwater Laboratory, which houses the departments of animal diseases and animal genetics, is nearing completion. This will meet a need of long standing for expansion in the facilities of the department of animal diseases.

Indiana Station.—Gerald O. Mott has been appointed associate in agronomy as leader of the pasture research project.

Kentucky University and Station.—Dr. J. Holmes Martin, professor of poultry husbandry and genetics and in charge of the poultry section of the station, has become director of the Bankhead-Jones Regional Poultry Research Laboratory at East Lansing, Mich., with which 25 north-central and northeastern State agricultural experiment stations are cooperating in an attack on problems affecting the viability of poultry. In its initial stages this laboratory will serve as a research center for the study of causative agents and control of fowl paralysis.

Maryland Station.—The university is completing a head house and three new greenhouses for use in the station research. The total area under glass will be approximately 10,000 sq. ft.

Minnesota University and Station.—Dr. Royal N. Chapman, formerly associated with the institution as chief of the division of entomology and economic zoology and since 1930 director of the Hawaiian Pineapple Producers' Cooperative Association Experiment Station and dean of the Graduate School of Tropical Agriculture of the University of Hawaii, will return as dean of the Graduate School of the university.

Dr. W. F. Geddes, chief chemist of the Dominion of Canada Grain Research Laboratory, has been appointed professor of agricultural biochemistry and agricultural biochemist.

The American Chemical Society has selected Dr. L. S. Palmer, professor of dairy chemistry and dairy chemist, as the first recipient of the Borden Company award of $1,000, which is to be given each year "for the purpose of stimulating fundamental research in the chemistry of milk in the United States."

Montana College and Station.—The resignations are noted of E. A. Starch of the station and extension departments of agricultural economics and William B. Nelson, instructor and assistant in agronomy.

New York State Station.—Dr. J. G. Horsfall has resigned as chief of research in the division of plant pathology to become head of the department of botany in the Connecticut State Station.

North Dakota Station.—James Greenlaw has been appointed assistant rural sociologist for research in the marketing of farm products.

South Dakota Station.—Additional funds for agricultural research during the next biennium have been provided by the legislature and will enable the station to enlarge its activities with respect to work on hybrid corn and low prussic acid-containing sorghums. Aaron G. Nelson has been appointed assistant in agricultural economics in charge of farm management vice H. P. Hanson, resigned to accept a position with the Minnesota University Extension Service in charge of land-use work in southern, western, and northwestern Minnesota.

Vermont Station.—According to a note in *Burlington Free Press*, a grant of $1,000 a year for 2 years has been made to the station by the Sheffield Farms Company for the establishment and maintenance of a fellowship for research in dairying.

Wisconsin University and Station.—Two gifts for research were recently accepted by the board of regents. One of these came from the Du Pont Company for research on dairy cattle problems and totaled $11,200. The other, valued at about $5,000, is the residue of the estate of Mrs. Gurine Gjermundsen of Pleasant Springs. This bequest sets up the Gurine Gulsteen Research Fellowship, the income from which is to be used for solving practical problems confronting the Wisconsin farmer in his daily life.

A two-volume bibliography on anaerobic bacteria and their activities in nature and disease has recently been published. This bibliography contains about 120,000 subject index entries and a chronological author index, and represents spare time effort extending over 14 years by Dr. Elizabeth F. McCoy, associate professor of bacteriology, supplemented by similar work since 1932 of L. S. McClung.

Announcement has been made of the forthcoming retirement of Dr. Abby L. Marlatt, director of the home economics department since 1909 and also widely known for her pioneer services beginning in 1890 in Utah and Rhode Island.

Wyoming University and Station.—Four new projects have been started to determine, when fed identical rations, the relative gains, cost of gains, and quality and dressing percentage of steers bred by Big Horn Basin cattle growers; the value of skim milk for fattening pigs when added to a ration of ground barley and oats; the effect of sugar beet byproducts in steer rations on gains, market grades, and dressing percentages; and the practicability of sheep feeding in irrigated sections where wet beet pulp is not available.

The judging pavilion of the university stock farm has been completely remodeled. A new seed house and poultry house has been built on the Lincoln County State Farm.

The leave of absence of Dr. R. H. Burns, associate wool specialist, has been extended to July 15.

Association of Land-Grant Colleges and Universities.—The fifty-third annual convention is to be held in Washington, D. C., from November 15 to 17, 1939.

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